

# RAILROAD GAZETTE

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## EDITORIAL ANNOUNCEMENTS.

**THE BRITISH AND EASTERN CONTINENTS** edition of the Railroad Gazette is published each Friday at Queen Anne's Chambers, Westminster, London. It contains selected reading pages from the Railroad Gazette, together with additional British and foreign matter, and is issued under the name Railway Gazette.

**CONTRIBUTIONS.**—Subscribers and others will materially assist in making our news accurate and complete if they will send early information of events which take place under their observation. Discussions of subjects pertaining to all departments of railroad business by men practically acquainted with them are especially desired.

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FRIDAY, MARCH 6, 1908.

The directors of the Erie Railroad on August 28, 1907, declared the regular semi-annual dividend on the first preferred stock and the regular annual dividend on the second preferred stock, in 4 per cent. interest-bearing scrip, payable in cash in 1917. Under the Public Service Commissions law of the state of New York, the company applied for authority to issue these interest-bearing dividend warrants. Decision of this application was delayed until March 1, 1908, when the Albany Public Service Commission, in an opinion written by Chairman Stevens, denied the application. The Commission holds that in order to authorize, under the Public Service Commissions law, the issue of stocks, bonds or other evidence of indebtedness (1) capital must be secured by the issue, (2) the use of such capital must be necessary for acquisition of property, construction or extension of facilities, improvement or maintenance of service, or for refunding, and (3) that the amount authorized be reasonably required for such purpose or purposes. Furthermore, that dividends can be declared only from surplus profits, which belong to the corporation and not to the stockholders until a dividend is declared. The Commission then points out that by the declaration of a dividend payable in the future no capital is secured, and that the issue of warrants evidencing such dividends is not necessary for any of the four specified purposes to which new capital may, under the law, be applied. By the declaration of a scrip dividend a company secures nothing which it did not possess before, and therefore under the law the issue of dividend warrants cannot be approved. In other words, the Commission will not authorize a company to put itself in debt for the purpose of paying dividends. As was remarked in the *Railroad Gazette* shortly after the declaration of these dividends, they represented what was really an enforced loan from the stockholders at 4 per cent., while the Erie was able to get money in the open market only at rates more than twice as costly as this. The decision of the Commission is in the direction of straightforward methods of railroad finance. It means that in New York state a railroad company will either decide to pay dividends or not to pay them, and that there will be no attempt to compromise by issuing obligations on the future. One of the interesting sidelights of this case is the fact that there is small reason to doubt

that with the industrial depression which has come about since last August, the directors of the Erie are likely to be the people most pleased by this decision.

The extent to which it is possible to control locomotive fuel expense by careful and systematic purchase and distribution of the coal, based on exact knowledge of its quality and other conditions affecting its economic use, was described in the paper presented at the November meeting of the Western Railway Club (*Railroad Gazette*, January 10, 1908). The scheme outlined is more or less theoretical, although it is backed up by about a year of experience on the Burlington, where the ideas and methods described are being gradually introduced. Naturally, it requires a long time—years—to get such a scheme fully in operation. While the plan has been worked out primarily on the basis of the conditions peculiar to the Burlington, the purpose of the paper is to present it in such form as to be generally adaptable. There is so much to commend in the plan that it is well worth the careful study of every manager interested in lowering the cost of this, the largest single item in his operating expense. The competitive points for the different kinds of coal determined by the equation used in the paper will, in nearly all cases, fall between division termini. While it is not so stated in the paper, it is not the intention that there actually should be a change of coals at such a point. The best results are got, of course, when the quality of coal is uniform over a division, since a change of adjustment in the locomotive is necessary to burn each different grade of coal with the best economy. A locomotive drafted for poor coal, if given a good coal would burn it wastefully, throwing an unnecessary quantity out of the stack. Practically, the change of coal would doubtless be made at the division point nearest the competitive point. Other factors of primary practical importance are grade conditions and the volume and direction of traffic. The former, the author points out, can be taken care of by the cost of haulage, which it is important to determine accurately. Concerning the latter, the plan would, of course, be subordinate to traffic requirements at all times. Traffic fluctuations and the ex-

gencies of operation incident thereto might disarrange the plan seriously at times, but the general good effect would not be lost. The chief advantages of the scheme as outlined have been summed up as follows: (1) Material reduction in the cost of fuel is shown to be possible. (2) Improved locomotive service, due to the use of uniform grades of coal. (3) Increased mileage and consequent increased earning capacity of coal cars.

#### A VAGARY OF THE RAILROAD SITUATION.

If one looks back on the panic periods of this country in their bearing on railroad affairs he finds that the period of 1837 had no such bearing at all simply because at that early date our railroads were practically non-existent. Coming down twenty years to the panic of 1857 conditions were essentially the same because the railroads had not risen to be a great fiscal interest. The two sharp panics of those periods were at bottom financial, with, of course, their shadows on general industry. Very different, as related to the railroads, were the panic of 1873 and the long drag of five years that followed it. By that time the railroads had grown to be a vast interest, and the panic of 1873 was, in fact, rooted in undue railroad expansion which in the two or three years preceding had become a kind of craze. Similarly in the later panic periods, including the present one, the impact on the railroads has been quick and severe. Having grown to a larger size and become closely identified with the industrial energy of the nation, railroads have also been the first to receive the shock. And this is also true probably of any panics to come in future years. We refer, of course, to the steam roads regarded as a great and pretty homogeneous transportation system and as distinguished from the street railways which, in the main, are still localized institutions and outworking their destiny, whatever it may be, under different and more limited conditions as contrasted with the steam lines.

Looking more closely into the panic periods in which our railroads have figured actively one notes, however, between those of the past and the present a sharp distinction. In the earlier panics of 1873 and later down to the present period the railroads, like other great vested interests, have been allowed to recuperate under natural law. It was a hard and inexorable law, but its workings were simple and logical. Credit was contracted, business receded, earnings fell off and the weaker roads went to the wall. There were receiverships, reorganizations and heavy individual loss, sometimes inflicted even upon the conservative investor, though, in his case, apt to be temporary. Combinations of capital and transitory devices like the clearing house certificates, modified and assuaged panic, but they did not affect much the railroad situation which had to work itself out through adversity and pain. But painful as was the ordeal of the railroads it was not intensified by artificial and extraneous agencies, and prosperity re-established itself under a law just as natural as was that which had brought adversity. The railroad corporations had one load, and a heavy load, to carry, but they did not have two loads, and, in a general way, and under the teachings of experience, they could foresee results, brace themselves to bear the burden and adopt the means to alleviate it.

For the first time in our national history one finds now those normal conditions shifted and the railroads in effect singled out from other great vested interests to be the victims not only of economic, but of artificial and man-made law. The man-made law even goes further and repeals or arrests the recuperative statute of political economy. There is no foe of the railroad, however demagogical he may be, who questions the place of the railroad not only as an industrial asset, but also as an element in public convenience and necessity. He would not have to be hard pushed to admit that the railroad is a more important ingredient of prosperity than the great factory. Yet not only does public policy not single out the great factory for attack, but even protects it under the tariff. Here and there in the form of conspicuous combination it becomes a target, but in the main public policy is protective. Not so with the railroad. It must be picked out from the mass of vested interests for assault from every quarter. Legislatures must raid it. State commissions must hamper it. Federal authority, with its far-reaching influence on public policy and temper, must menace it. It may raise wages liberally in good times, but it must be denied the right to lower them in hard times. Fundamental rights of property conceded to the meanest citizens—and to private corporations—must be refused the railroad carrier. The dollar placed in private enterprise is guarded by law, the dollar placed in the public serving railroad must be penalized. Recession of pay and prices is the normal

process by which hard times emerge into better times. Yet authority is doing its best to suspend, in the case of the railroads, that remedial process and, unless all precedent misleads us, is thus postponing the recovery.

The times indeed are extraordinary and unprecedented. For the first time in American history, and it may even be said, in the history of nations, great forces are seeking to check or, at least, retard the normal remedies of panic and after-panic and administer to the patient, medicines not only novel but in their character directly opposed to normal therapeutics. Big trade combinations are declaring that prices must be maintained however low the volume of business falls. The unions, in a somewhat similar combination and mood, are declaring that wages must be sustained even though men be discharged and the profits of the employer still fall; and a great branch of the nation's industry, the railroads, is not merely marked for continuous attack, but refused the primary right of the employer and property owner to help himself. These may be policies that will cure hard times and be panaceas for industrial ailment, but they are of a nature to amaze Adam Smith or John Stuart Mill.

#### PENALTY LAWS IN THE SOUTH.

We print this week, on another page, an abstract of the principal railroad penalty laws in a group of southern states. The list is very instructive. Most of the penalty laws were enacted during the extraordinary pursuit of state legislation which followed the activity of the national government in 1906, and the schedule perhaps illustrates as well as any other single document the effect which the federal government's methods of invective has had on the minds of state politicians who have seen and remembered the success which has attended this sort of thing in the highest quarters. The plain assumption that the railroads are acting unfairly and that their occasional failures of service are wilful, runs through all this mass of penalty legislation. The tone and moderation of these laws suggests the tone and moderation of the popular tribunal which meets Saturday evenings in the village store. There is no thought of fair play or of giving the railroads a chance to explain or justify their own position. Thus, in Alabama the free time under the car service rules is 72 hours on a large range of commodities, and carriers are not permitted to release cars by unloading carload freight for storage into their own warehouses or into public or private warehouses until \$5 demurrage charges have accrued; that is to say, until the carrier has suffered about ten days' delay. If a company enters suit through the federal court, its license to do business in the state is canceled, and the carrier must, to all intents and purposes, insure freight more broadly than any chartered insurance company in the world, since it is illegal for it to enter into any contract limiting its liability for loss or damage to property in transportation, whether or not this loss or damage is caused by act of God or the public enemy. In Georgia, there is a penalty of a dollar per car per day for failure to furnish cars for loading within four days, Sundays and legal holidays excepted; there is a penalty of full damage to be paid by the initial line, regardless of place of damage, for failure to trace freight and advise applicant within 30 days of the cause and place of delay or damage; and there is a penalty of \$50 for failure to pay loss or damage claims on intrastate business within 60 days. In North Carolina, the penalty for not furnishing cars within four days of application is \$5 per car per day, entirely regardless of the car supply situation, although the North Carolina legislature doubtless knew or was in position to find out that there have been times within the last two years when the Angel Gabriel could not have gotten freight cars for \$10 a day.

The discouraging thing about an exhibit of enactments like this is that the state legislatures do not care in the least whether they are unjust to the railroads or not. It is a comparatively simple matter to right law-made wrongs which have been occasioned by ignorance and misapprehension, but it is not so easy to remedy grievances that are the result of direct intention. We feel sure, however, that it will not be long before the most harmful and injurious of these laws are repealed. Wisconsin gave an example of this in the seventies, as everybody knows, and it must always be remembered that lawmakers, however dim their economic vision, may be counted upon to have a perfectly clear sense of the things that make for popularity. Railroad development in some of the states that have been hardest hit by this legislation has received a setback the extent of which cannot yet be realized, but will be seen plainly when capital is again actively seeking investment and turns away from the states where it is treated with conspicuous injustice.

We have already expressed the opinion in these columns that repeal of the most iniquitous statutes will occur before they have time to get to the Supreme Court, and we should be very much surprised if the pendulum of legislative enactment did not swing a long way back from its present position, which is certainly high above the point of equilibrium, on the radical side. Meantime, there is one feature of the situation which must not be overlooked. If the existing lines in some of the most troubled states can contrive to live under the state laws at all, they ought to be able to live without competition, and it may well be that there are areas where the 1907 crop of legislation is preferable to the competition which would surely have come within a year or so if the attitude of the state had been friendly to corporations. This principle has for some time found an example in New Jersey, where the tax requirements are so onerous that new capital keeps away from steam and electric enterprises alike. Thus, after all, it may turn out that the existing lines in some of these southern states will not eventually be hurt as much as they anticipate.

#### THE LAW OF LATENT DEFECTS.

A recent decision in the courts of the state of New York in which an interpretation is given of the law governing responsibility for mechanical defects of such a nature or so located as to make their discovery an impossibility under any ordinary system of inspection is of peculiar interest to those who have to deal with such matters in railroad rolling stock equipment. An investigation covering the whole range of decisions discloses the somewhat remarkable fact that reliance is placed in nearly every case subsequently decided upon a decision rendered in 1852 in *Hegeman vs. Western Railroad Corporation*, 16 Barbour, 353, and affirmed on appeal, 13 N. Y. 9, two justices, however, dissenting. The facts may be stated as briefly as possible: Plaintiff on September 9, 1850, was on his way from Greenbush to Boston. Near Hinsdale, Mass., the car in which he was seated was derailed and broken up by the breakage of an axle. Examination subsequently disclosed a fire-crack 11 in. inside the wheel and about 16 in. from the middle of the axle, where the breakage occurred. The accident resulted in the death of three passengers and the plaintiff was permanently crippled.

An interesting side issue brought out during the trial was the existence of something known as a safety beam, which it appeared had been in use upon New York and New Jersey roads for some 10 or 12 years. The use of this beam it was said would prevent a broken axle from falling on the track or thrusting up against the car and a car could run a long time with a broken axle. Among the witnesses upon this point were Mr. Bradley, of the Bradley Car Works, and Mr. Bouton, master mechanic of the Watervliet arsenal.

In his charge the judge stated to the jury that defendant was responsible for all defects in the axle whether the car had been built by the railroad company or by an outside manufacturer, and it was for the jury to say whether the defect could have been discovered by investigation and remedied; that if the safety beam were capable of preventing serious results from such an accident it did not necessarily follow that defendant was liable because the device had not been adopted. It was for the jury to say whether defendant had been negligent in this regard. The jury gave a verdict for plaintiff for \$9,900.

On appeal, the prevailing opinion held that defendant was responsible for damages if the defect could have been discovered in the process of manufacture by the application of any test known to men skilled in the business. The significant feature, however, of this decision was in sustaining this position in the charge of the trial judge: That although the defect was latent and could not have been discovered by vigilant external examination, yet if it could be discovered by a known test applied either by the manufacturer or by the defendant, the latter was responsible. The dissenting opinions were offered on the ground that the position of making a railroad company responsible for all defects whether discoverable or not was not tenable and it would be dangerous to establish such a rule. Another point of dissent was to the position that defendant was as responsible as if the car had been built in the company's shops. The manufacture of cars is a distinct business and the workmen employed are in no sense servants of the railroad company.

It is of interest to note in passing a citation from an earlier case that "a coach proprietor is liable for all defects in his vehicle which can be seen at time of construction as well as for such as

may exist afterwards and be discovered on investigation; if not, he might buy ill-constructed vehicles and his passengers be without remedy." It was affirmed also that the degree of caution required in stage-coaching was not as great as in steam railroading where trains run at a high rate of speed, which, in this case, was shown to have been 25 to 30 miles per hour, or "the ordinary speed of passenger trains." The car was a new one and had been laid up during the two winters of its life because the company "did not want to deface it by putting stoves into it."

In the appellant's brief it was contended that carriers are not insurers and to hold them responsible for latent defects was tantamount to making them insurers. It is an impossibility for a railroad to do all its own work; it must depend upon others and the law will protect it against things which elude human sagacity. If greater care is required than in the case of the stage-coach, the passenger takes the risk for the benefit of the higher speed. The whole charge was characterized as "singularly inaccurate" and as requiring defendant to possess greater knowledge that was available at the time. Nevertheless, the judgment of the Supreme Court was affirmed.

In several other cases, notably in *Palmer vs. D. & H. C. Co.*, 46 Hun, the rule laid down in the *Hegeman* case was sustained in every particular. In the case cited, the court said: "These cases sufficiently indicate and illustrate the views of the Court of Appeals of this state and of the Supreme Court of the United States with reference to the duty of railroad companies towards the passengers they carry on their trains."

But far more stringent is the doctrine laid down in *Alden vs. New York Central*, 26 N. Y. 102. In this case the accident was caused by breakage of an axle from a crack so concealed by the hub of the wheel as to be undiscoverable without removing the wheel. The Court of Appeals affirmed the judgment sustaining a verdict for the plaintiff. It adopted the rule of vigilance and care laid down in the *Hegeman* case, but suggested that the ground of that rule lay not in the negligence of the carrier but rather in that the carrier seems to be an absolute insurer of the passenger's safety.

The *Alden* case was, however, disapproved in *McPadden vs. N. Y. Central*, 44 N. Y., and the rule in the *Hegeman* case reasserted and followed with the limitation that the rule did not apply so as to render a railroad company liable for injury caused by the breaking of a sound rail by reason of extreme cold which could not have been anticipated or avoided by any human foresight.

In *Brignoli vs. Chicago Great Western*, 4 Daly 182, the defendant was held liable for a broken rail owing to a defective cross-tie. The car in which the plaintiff was a passenger overturned and his shoulder blade was broken without negligence on his part.

While none of these cases is especially remarkable of itself, a mention of them appears to be of value as indicating the closeness with which subsequent decisions have followed the *Hegeman* case. Notwithstanding the development in all lines of railroading since 1852 when there were less than 10,000 miles of railroad in the country, and when the precedent established by that case was itself supported upon precedents of stage-coaching days, the law so far as it relates to hidden defects in mechanical appliances in railroad equipment appears to have then been established beyond probability of disapproval.

#### Pennsylvania Railroad.

The Pennsylvania system now includes 11,176 miles of line, of which 6,078 are East and 5,097 West of Pittsburgh and Erie. The gross earnings of all lines East in the year ended December 31, 1907 were \$216,000,000, and of all lines West for the same period, \$110,000,000. Thus the total earnings of "all transportation companies owned, operated or controlled by or affiliated in interest with" the Pennsylvania were just under \$327,000,000, an increase of \$31,000,000, or 10 per cent., over the year 1906. Net earnings of all companies were \$83,600,000, against \$84,400,000 in 1906, a decrease of \$700,000, or less than 1 per cent. During the year these lines carried 3,800,000,000 passengers one mile and 37,700,000,000 tons of freight one mile.

The Pennsylvania Railroad proper includes the cream of this immense system. The operations covered by the sixty-first annual report, just issued, are those of the 3,903 miles including trackage rights, directly operated by the Pennsylvania Railroad, of the total 6,078 miles of line east of Pittsburgh and Erie. These returns do not include the Philadelphia, Baltimore & Washington; the Northern Central; the West Jersey & Seashore; the Cumberland Valley; the New York, Philadelphia & Norfolk; the Baltimore, Chesapeake

& Atlantic; the Maryland, Delaware & Virginia, or the Long Island Railroad, all of which are east of Pittsburgh.

The lines directly operated are in five grand divisions. The Eastern Pennsylvania division includes 1,248 miles of line, made up of the main line and branches between Philadelphia and Altoona. The Western Pennsylvania division has 632 miles of line and includes the main line and branches between Altoona and Pittsburgh. The New Jersey division includes 475 miles of railroads, the ferries from Jersey City to Manhattan and to Brooklyn, two miles, and the Delaware & Raritan canal, 66 miles. The Erie division, the old Philadelphia & Erie, has 605 miles and runs from Wilkesbarre and Sunbury to Erie, on Lake Erie. The Buffalo & Allegheny Valley division has 830 miles and reaches Buffalo and Rochester on the north and Pittsburgh on the south. The lines directly operated, and these only, except for the New York & Long Branch Railroad, which is operated under special contract jointly with the Central Railroad of New Jersey and is included, are shown on the accompanying map.

The gross earnings of these 3,903 miles directly operated were \$164,800,000 last year, against \$148,200,000 in 1906, an increase of 11 per cent. But the Pennsylvania had the same experience as other railroads and operating expenses rose from \$101,800,000 in 1906 to \$119,600,000 last year, an increase of 17 per cent., which was larger in amount than the gain in gross earnings. Net earnings, in consequence, were \$1,200,000 smaller than in 1906. To the 1907 net earnings was added the "other income," mostly income from investments and interest, amounting to \$13,800,000, making a total fund of \$59,000,000 available. After deducting from this, rentals paid to roads operated on the basis of net earnings, \$4,900,000; taxes, \$4,000,000, and other fixed charges, \$16,600,000, there was a net income of \$33,600,000, against \$35,700,000 in 1906, a decrease of \$2,100,000.

Dividends paid amounted to \$21,900,000, against \$19,900,000 in 1906. Payments of principal of car trusts amounting to \$3,200,000 were made, as against \$4,200,000 in 1906. There was a sharp reduction in the extraordinary expenditures, from \$8,700,000 in 1906 to \$3,300,000 last year, but in addition \$2,500,000 was transferred to the extraordinary expenditure fund in each year. The year's surplus was \$2,400,000, which was transferred to profit and loss, while in 1906 no part of net income was so applied.

Profit and loss account was also credited with \$4,600,000 received as profit from the stock dividend of the Northern Central, adjustment of value of securities owned in roads absorbed, and settlements of sundry accounts. In 1906 profit and loss was increased \$15,200,000 mainly through the sale of Baltimore & Ohio and Chesapeake & Ohio stock. It is through this account that the New York tunnel line is being financed. There was \$7,000,000 taken from this credit balance for this purpose in 1907 and \$13,000,000 in 1906. In 1906 there was also \$2,200,000 transferred from profit and loss to the extraordinary expenditure fund. As a result of these various adjustments, the profit and loss credit balance on December 31, 1906, and December 31, 1907, was the same—\$24,700,000.

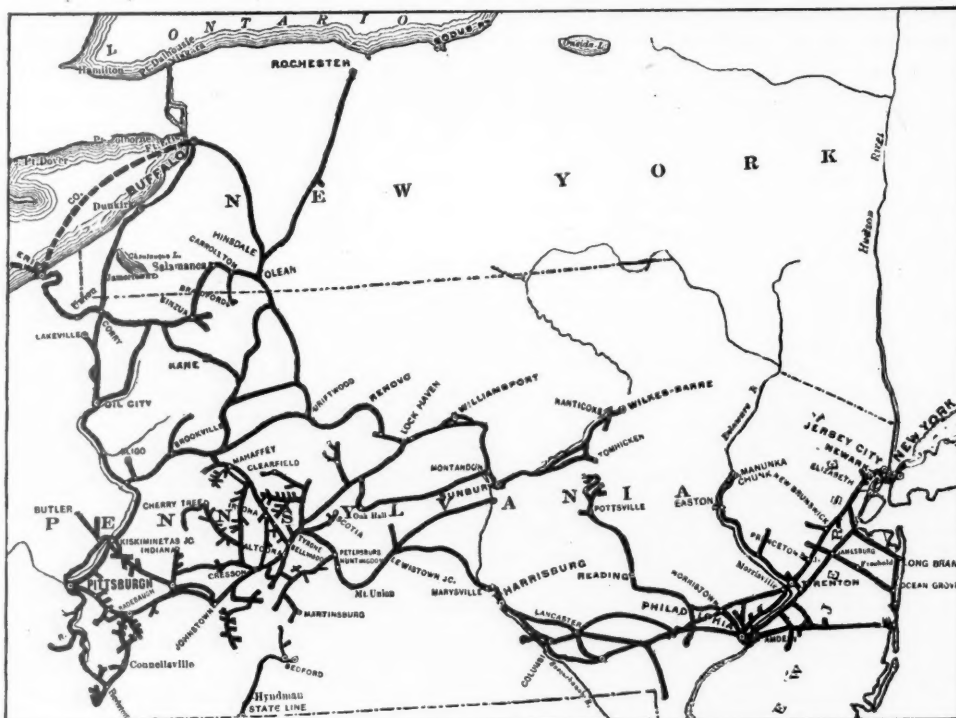
The cost of the New York tunnel extension to December 31, 1907, appears to have been \$69,500,000, of which \$39,500,000 is capitalized on the balance sheet and \$30,000,000 has been charged against income and profit and loss. The present status of the work, as shown more in detail in our Railroad Construction column, is that the tunnels under the Hudson river are finished, the foundations for the station between Seventh and Ninth avenues at Thirty-second street are finished and work on the steel structure of the building has begun, the tunnel under Manhattan island is nearly finished and two of the four tunnels under the East river have been joined, with every prospect that the other two headings will meet by the end of next month. There have been and will be substantial credits to the cost of the work from the sale of real estate not permanently required. From this source \$1,600,000 was received last year, the main item in this amount being the payment by the United States Government for the post office site on Eighth avenue between Thirty-first and Thirty-second streets.

President McCrea sums up the operating results of the year as follows:

"There was a heavy increase in the volume of freight traffic until December, the tonnage and ton mileage for the year showing a large gain and the revenue, an increase of more than 12½ per cent. over the previous year; but there was a material reduction

in the gross and net earnings per ton mile. While the increase in the passenger traffic was much below the percentage shown in 1906 over 1905, being but 9.13 per cent. as against 14.41 per cent., the gross revenue therefrom increased barely 4½ per cent., as compared with a gain in 1906 of 14 per cent. over 1905. The expenses, also, were largely increased, the cost per passenger mile showing an increased percentage of nearly 13 per cent. and the cost per train mile an increase of nearly 17 per cent. As a result there was a reduction of nearly one-third in the net earnings per passenger train mile; and while this was due in part to a more accurate distribution of expenses as between freight and passenger traffic, it was clearly shown that the lower fares which prevailed during part of the year had not stimulated traffic to the extent necessary to offset the loss of revenue and the higher cost of operation due to the increase in wages and cost of supplies. It may be noted that the average rate received on the entire system during the year was less than two cents per mile."

The detailed operating expense accounts are made up in a peculiar way, as a result of the changes in classification made by the Interstate Commerce Commission on July 1, 1907. Each sub-heading which is the same under the old and the new classification, is shown for the full year. On the other hand, sub-accounts which were changed by the new classification are shown under the old heading for the first half of the year and under the new heading for the second half. For instance, under maintenance of way, engineer-



Pennsylvania Railroad.

Lines East of Pittsburgh and Erie directly operated.

ing and superintendence covers one-half of the year and superintendence the other half. Under maintenance of equipment, depreciation accounts are shown for the second half of the year. Depreciation on steam locomotives amounted to \$275,000, on passenger train cars \$267,000 and on freight train cars \$2,000,000. Conducting transportation has disappeared, and in its place are the two accounts, traffic expenses and transportation expenses abbreviated in the general summary to "traffic" and "transportation."

Maintenance of way per mile operated cost \$5,192 per mile, against \$4,378 in 1906; repairs, renewals and depreciation of equipment (no renewals of steam locomotives) cost \$3,315 per locomotive, against \$2,652 in 1906; \$1,381 per passenger car, against \$1,144 in 1906, and \$118 per freight car, against \$103 in 1906. There were 7,728 cars bought during the year, which with 2,540 other cars bought for the Lines West were provided for by \$11,900,000 of new car trust securities. At the close of the year the Pennsylvania Railroad owned 3,210 locomotives, 2,070 passenger train cars and 128,024 freight cars. No new locomotives or passenger cars were acquired during the year, but the number of freight cars available for service rose from 119,036 on December 31, 1906.

One of the most remarkable results shown is an increase of over 40 per cent. in the tonnage of the combined Eastern and Western Pennsylvania divisions, which carried 142,000,000 tons, against 101,000,000 tons in 1906. The increase in tonnage carried by the five grand divisions was 12 per cent., and the increase in ton mileage 16 per cent., which was handled with an increase of only 7 per cent. in freight train mileage.

Mr. McCrea sums up the company's policy for the

immediate future and the present business situation as follows:

"In pursuance of the policy announced in the last report, the expenditures for the year were confined almost exclusively to completion of work actually under way; and it is gratifying to note that with the exception of a part of the relief freight lines for which no present necessity exists, substantially all the improvements outlined in the report for 1902 as essential to put the road in condition to meet the legitimate demands of its traffic have been completed. As a result, the average daily mileage of freight cars moved over its lines increased about 20 per cent. between 1903 and 1907. The expenditures for the present year will be practically confined to finishing the work now in progress on the main line and to the tunnel extension to and through New York and the terminal station in that city.

"The prosperity which had existed for a number of years in all branches of industry and which had so exceptionally increased the traffic on the railroads met with a severe check in November last, which is now largely affecting the revenues of the system. While a number of causes seriously disturbed public confidence and thus brought on the financial panic which has so sharply affected the business interests of the country, an important one undoubtedly was the fear that, as the result of recent federal and state legislation, the regulation of the railroads had approached so nearly to an effort to control their management and revenues, that the investments therein were not assured of that protection to which they are justly entitled. Eventually, it may be assumed, the questions that arise will be fairly adjusted, but in the meantime the railroads have to face the loss of revenue consequent upon the enforced idleness of a large portion of their equipment, while to a proportionate number of their employees this has necessarily brought about either an entire loss of employment or a material reduction in the hours of labor."

A summary of Mr. McCrea's remarks about the various construction projects of the company and its affiliated lines will be found in the Railroad Construction column.

The following table shows the operating and income results of the Pennsylvania Railroad, including only the lines directly operated:

	1907.	1906.
Mileage worked .....	3,903	3,897
Freight earnings .....	\$123,826,165	\$109,960,888
Passenger earnings .....	32,623,889	31,231,338
Gross earnings .....	164,812,826	148,239,882
Maint. way and structures .....	20,265,845	17,060,498
Maint. of equipment .....	31,721,614	26,201,245
Traffic expenses .....	2,034,705	1,772,012
Transportation expenses .....	61,835,024	53,504,168
Operating expenses .....	119,607,348	101,805,644
Net earnings .....	45,205,477	46,434,238
Other income .....	13,794,106	12,784,262
Net earnings and other income .....	58,999,583	59,218,500
Net income .....	33,575,056	35,674,301
Dividends .....	21,908,436	19,869,661
Principal of car trusts .....	3,150,694	4,246,039
Extraordinary expenditures .....	3,260,651	8,701,475
Transferred to extraordinary expenditure fund .....	2,500,000	2,500,000
Year's surplus .....	2,351,424	.....
Applied from profit and loss to New York tunnel line .....	7,000,000	13,000,000
Applied from profit and loss to extra. expenditure fund .....	.....	2,200,849

#### NEW PUBLICATIONS.

*Air-Brake Catechism.* Twenty-first edition; revised and enlarged. By Robt. H. Blackall. New York: Norman W. Henley Publishing Co., 375 pages; 5 x 7 in.; 131 illustrations. Cloth. Price, \$2.00.

Perhaps the most salient feature of this book is the fact that the text and illustrations are confined exclusively to apparatus made by the Westinghouse Air-Brake Company. The discussion is confined to practice on this side of the Atlantic, where the author has gained his experience. As its name indicates, the work is in the form of a catechism, and the questions and answers are couched in simple language, readily understood even by those who are not in the habit of acquiring information from books. In its arrangement the catechism follows the chronological order of the development of the brake itself, starting in with the very simple construction of the straight-air design, as first introduced, and proceeding through the plain automatic, the quick-action, the high speed and the new "K" triple valve that is now superseding the earlier form of quick action triple valve. In this way the reader is led on from the simple to the complex, in construction and action, just as the railroads have been led on in the use of the air-brake itself. Thus the book represents the evolution of the brake, and it would be exceedingly difficult for a novice in any other way to grasp the complexities of the operation of the latest developments, though it becomes comparatively easy to do so when led up to it, step by step, provided, of course, that close attention is given.

The book deals not only with the air-brake mechanism and operation in themselves, but takes up the auxiliary apparatus, such as the brake slack adjusters, the hanging of brake-shoes, the water brake, the Sweeney compressor, the air signal and the calculation of leverages.

The general description of the apparatus is either followed or

accompanied by instructions regarding the operation and maintenance, including inspecting and testing, together with an outline and indication of the principal causes of trouble with the system. Here much detail must necessarily be omitted; otherwise the one volume would be expanded to a dozen or more, as would be indicated by a reference to the reports of the Air-Brake Association. Still there is enough to serve as a reliable guide for practical, everyday work, whether on the engine, in the cars or on the track as inspector. As a whole, the book serves as a striking object lesson of the magnitude and importance of this branch of the railroad service; a branch which, in the eyes of the general public, is only seen in a vague and indefinite way and then usually in connection with a disaster.

The weak point in the book is one common to many of its class, and it lies in the index. This is incomplete, in that some things in the book are not mentioned at all, while others would be made much more available by a better cross-indexing. If a book is to be used for quick and ready reference the short-comings of the index will quickly make themselves known. With this exception, however, the design and arrangement of the book is to be heartily commended.

*Table of Quantities for Preliminary Estimates.* By E. F. Hauch and P. D. Rice. New York: John Wiley & Sons. 92 pages; 4 in. by 6 1/2 in.; cloth. Price, \$1.25.

This book contains a series of tables of quantities contained in 100-ft. sections with roadbed widths of from 12 ft. to 32 ft. varying by 2 ft. and for a width of 35 ft. These are worked out for side slopes of 1/4 to 1; 1/2 to 1; 3/4 to 1; 1 to 1; 1 1/4 to 1, and 1 1/2 to 1. These are followed by tables of toe slopes for the same widths of roadbeds and for slopes of 1 1/4 and 1 1/2 to 1. In all cases the quantities are estimated for heights running from 0 to 50 ft. at 1 ft. intervals and for transverse slopes ranging from level to 35 deg. on 5 deg. differences. At the back of the book there is a table of cubic yards based on calculations made from the sum of end areas for lengths of 100 ft.; a table of decimals of a mile expressed in feet; one of acreage for a right-of-way 100 ft. wide; one of chains reduced to feet; another of feet reduced to decimals of a chain, and a table of fractions of an inch in equivalent decimals.

The tables have been prepared to meet the requirements of the locating engineer, and the calculations were made for each successive value of the height by means of differences that checked with the calculation of the final height, so as to avoid all possibility of mistakes. In making these calculations, five (and in some cases seven) place logarithms have been used, and it is believed that the tables are correct to the nearest cubic yard.

*Statistical Tables.*—Information Relative to American Railroad and Industrial Companies, and Details of Securities Dealt in on the New York Stock Exchange. 84 pages; 3 1/4 x 5 1/4 in. Published by Spencer Trask & Co., Bankers, New York. 1908 edition.

The bankers who prepare this handbook for distribution, free of charge, to their customers and prospective customers, have done a thorough job in small space. The tables show at a glance the principal points on which an investor wants information, and cover a wide range of investments.

*The Men Who Sell Things.* By Walter D. Moody. Chicago: A. J. McClurg & Co., 1907. 295 pages; 5 x 7 in.

This breezy little book is described as containing the observations and experiences accumulated by the author in over 20 years as traveling salesman, European buyer, sales manager and employer. It is exceedingly easy to read, and in a rather slangy, narrative style, brings out a good many ideas which ought to be helpful to young salesmen.

## CONTRIBUTIONS

### Late Trains.

New York, March 2, 1908.

TO THE EDITOR OF THE RAILROAD GAZETTE:

There is an unconfirmed rumor that the New York Public Service Commission of the Second district is going to try to cure that crying evil, the late train. Whether with this end in view or not, the railroads have recently been ordered to make an itemized report each month of the number of delayed trains, the length of the delay and the causes. Primarily this is a report of engine failures, and there is a list of 53 items classified under the general headings of heating or hot bearings, steam failures, leakages, breakages and miscellaneous causes. The inference to be drawn from the arrangement of the report is that engine failures, in one form or another, are responsible for the majority of train delays. But in order that the showing may be complete, there are three causes of delay that, under a rigid interpretation, may be made to cover all others outside of the engine failures. These are heavy trains,

terminal, and other causes. These reports will necessarily throw light on train delays and the reasons for them and certainly there is need for some such independent gathering of the facts. This evil is surely capable of being remedied. The rolling stock in use is as a whole not in such a dilapidated condition that it cannot be run over a division without a breakdown. If, then, it can do this, the trouble must be looked for in a schedule faster than the engine can make, in such defective terminal facilities that trains cannot be run through the yards, or in inadequate train and station crews for expeditiously handling passengers, baggage and express. The natural remedy would be either to cut the schedule speed down till it comes within the limits of the facilities or to increase the facilities. As matters stand, except on a few roads, notable exceptions, it is the general expectation of the public that trains will be late. People merely wonder how late. If the Public Service Commission can reform this state of affairs it will have done a very great thing toward establishing itself in public favor. It will have brought about a lasting and substantial service to the railroads as well, by removing one great cause of irritation that has contributed much toward the unpopularity of railroad corporations.

TRAVELER.

### The Subway Car.

[There was published in the *Railroad Gazette* of February 28, 1908, part of a report to the Public Service Commission for New York City by Bion J. Arnold, Consulting Engineer, on subway cars. This part of the report covered the general discussion of the problem of handling the traffic in the present subway operated by the Interborough Rapid Transit Company, a description of the recommended type to which the present subway cars should be converted to get maximum efficiency, and Mr. Arnold's general recommendations. The rest of the report, which follows, is a discussion

find that at present the all-metal cars can be rebuilt at an expense of \$2,000 per car, and the composite cars altered at a cost of \$1,500 per car. A drawing of the present car before and after being altered to a car with central side doors is shown in Fig. 1. These figures contemplate the reinforcing of the sides of the car and the trussing of the under frames in such a way as to leave the changed cars practically as strong as the present car. The weight in both cases will be slightly increased by the introduction of the central side doors in the present car.

Cars of this type have been in use on the Brooklyn Bridge shuttle trains for many years. They have recently been introduced for subway and elevated service in Boston and Philadelphia, and have been adopted by the Hudson & Manhattan Railroad for use in the new tunnels between Manhattan and Hoboken. The Hudson & Manhattan cars are fireproof cars with central side doors and at the same time weigh less than the present subway end-door cars, demonstrating that, if desired, future cars can be built with central side doors without excessive weight and at the same time possess the fireproof qualities desirable for subway cars.

In the Brooklyn Bridge shuttle-train service, the cars were unloaded to one platform and then loaded from a separate platform, thus avoiding the conflict of passengers, which is such a noticeable feature of the subway. The advantage of the center door in this case was simply that of additional door space, and for the Brooklyn Bridge conditions the location of this extra door space in the center of the car side was most advantageous. At the time the shuttle trains were abandoned on account of running the Brooklyn Elevated trains directly into the Manhattan terminal, the lack of this extra door space in the present elevated cars was decidedly noticeable, emphasizing the fact that the cars of the single-end door type are not adapted for handling the New York City rush-hour crowds. No difficulty in connection with maintaining a circulation of passengers was experienced with the central door cars because of the separate loading and unloading platforms,

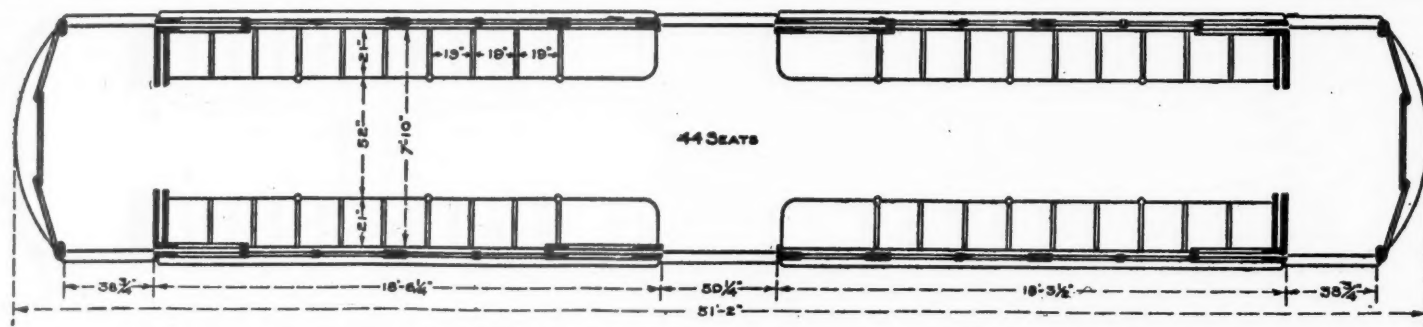


Fig. 2—Car With Central Side Door and End Doors. Longitudinal Seats, 44 Seats.

of the various types of cars which can be used in rapid transit work and the various kinds and arrangements of seats in them. In order to start the argument intelligently, the brief summary of the desired requirements for a successful car and of the classification of the various cars is repeated.—EDITOR.]

#### TYPES OF SUBWAY CARS.

A successful car for the present subway should possess as many as possible of the following requirements:

1. Separate entrances and exits.
2. A space which can be cleared so as to be ready to quickly receive the passengers boarding a car.
3. Convenient means of circulation inside a car.
4. Standing-room space contiguous to the exits.
5. As many cross-seats as practicable.
6. Exit and entrance doors sufficiently removed from each other to allow for the car's stopping convenient to guiding rails on the platforms.
7. Doors located so as to minimize the danger from open spaces at curve platforms.

The various cars may be classified in accordance with the number of doors in the sides of the cars as follows:

- Cars with central side doors and end doors.
- Cars with two quarter side doors.
- Cars with three doors near center.
- Cars with multi side doors.
- Cars with double doors near ends.

Each one of these types may have seats of either the longitudinal, the cross "back-to-back," or of the "walk-over" style, or a combination of two or more styles, as will be shown more in detail as the cars are described.

#### CARS WITH CENTRAL SIDE DOOR AND END DOORS.

It has often been suggested that cars provided with an additional door in the center of each side would at once do away with the conflict of passengers which now takes place at the present end doors of the cars, and at the same time, by providing additional door space, materially reduce the station waits.

The present cars could be altered to provide central side doors. I have made a number of studies of details of construction and general arrangement of seats applicable to a car of this type. I

so that little can be learned from the operation of these cars on the Bridge that can be applied to the study of the car problem of the present subway.

In Boston conditions are more nearly similar to the subway service, although the excessive transfer of passengers at the stations is lacking. In many stations, however, passengers now enter and leave the cars, using the same station platform, and, in order to avoid the conflict between these two streams of passengers, an effort was made, when the central-door cars were first put in commission in Boston, to set up a circulation by making it the rule for passengers to enter this car at the end doors and leave by the center door. Signs were posted in the cars, and at the same time the car guards and station attendants were instructed to carry out this regulation, but the effort has proved futile. It has been found that the Boston passengers could not be controlled sufficiently to maintain this much-desired circulation. Some passengers would persist in getting off through the end doors, while others would insist on getting on the cars through the central doors, thus causing considerable annoyance to passengers who were endeavoring to obey the rule, and ending generally in confusion. The operation of the cars in actual practice, therefore, has finally resulted in partially reverting to the old plan of allowing passengers to leave and enter the same door. Under these circumstances the extra door in the side of the car has reduced the conflict of passengers by providing additional door area, resulting in somewhat decreasing the station waits, although the time of these station waits has not been reduced much below that found in the present New York subway.

With the Boston experience in mind, it is hard to see how the car of the central side-door type would greatly relieve the New York subway conditions, on account of the usual excessively congested condition in the cars during rush hours. When a passenger boards one of these crowded cars with the intention of getting off at the next station, he should not be compelled to push himself through the standing passengers in the car in the short time which it takes to run between stations, and even if this circulation in the car could be maintained, the movement of the passengers from the end door to the central door would become an objection-

able feature, causing nearly as much discomfort to the passengers and delay to the trains as the present method of operation with the single end doors. It would, therefore, seem that to attempt to compel all passengers to maintain circulation by entering the end doors and leaving by the central door would not be effective under the congested condition of the present subway.

The Hudson & Manhattan cars will operate under conditions very similar to the Brooklyn Bridge terminal service; that is, a large majority of the passengers will get on the cars at the stations at one end of the line and get off at the stations at the other end. In such service it is not essential to maintain a circulation of passengers in the car, as the transfer privilege is not a factor to be contended with. Under these circumstances, the central side door, cutting down as it does the average length of time required by a passenger to reach a seat, and at the same time furnishing a wider door space, will add materially to the comfort and speed with which the passengers can be handled. The successful use of the central side-door car in terminal work, however, does not furnish a precedent which demonstrates that this type of car

ever, are not available for use with the present subway car, and the introduction of an additional door in the center of the present car would therefore mean the use of a sliding platform at a number of the stations where the cars stop at curved platforms of which the edges next to the car are concave.

The present platforms have been built of sufficient length to serve only one door of each end car of each train, and the end cars therefore lap over the end of each platform. To get the full benefit of the introduction of central doors in the sides or the cars, it would be necessary to extend each platform at least 50 ft. There are no difficulties, however, in accomplishing this extension, except the matter of expense, which would be considerable, on account of the inconvenience of carrying on the work and at the same time keeping the subway trains in operation, but this expense and inconvenience could not, in my judgment, be justified by the advantages gained.

With the central side-door car it would be expected that the train guard, who now opens and closes the doors from his position between two cars, would experience difficulty in operating the addi-

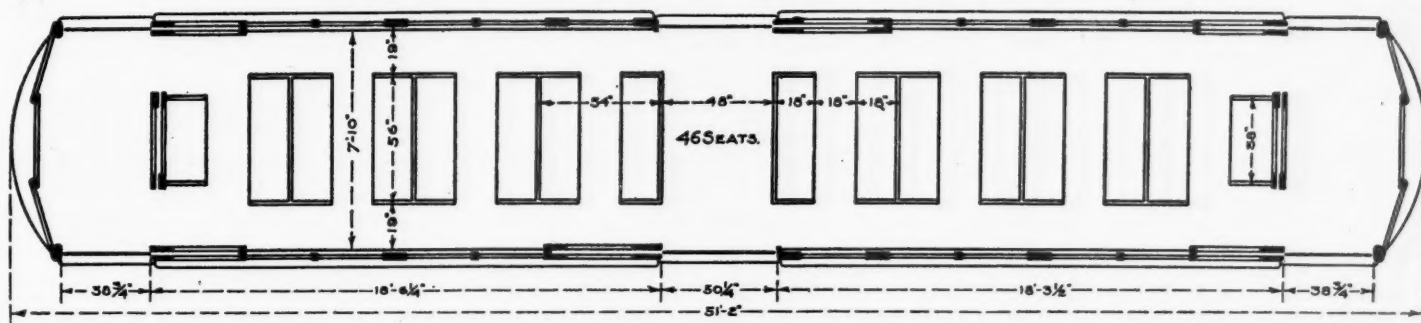


Fig. 3—Car With Central Side Door and End Doors, Using Present Subway Car Body. Cross Seats Back to Back With Two Aisles, 46 Seats.

would be satisfactory under subway conditions, whereas the failure of the center-door car on the Boston subway to reduce the length of stop to much less than the time required in the New York subway even with the present end-door cars, does not furnish any encouragement toward rebuilding the present subway cars so as to provide them with central doors.

The difficulty of operating the central side-door car in the present subway with curved platforms at many stations has been often pointed out by the subway officials. There is no doubt that the use of these curved platforms, even with the present type of car, is a source of danger and the cause of considerable delay, both of which could have been avoided if the platforms had been built with straight edges.

The stations at which the curved platforms would give trouble with a central door in the side of the car are shown by the follow-

tional center doors, particularly during rush hours, but as station attendants are now provided at express stations for handling passengers at times of heavy traffic, this difficulty should not be serious.

Several possible arrangements of seats with a central side-door car are shown in the accompanying drawings. The number of seats above the established minimum of 40 indicates at once the increase over the present seating capacity secured by each car.

CAR WITH CENTRAL SIDE DOOR AND END DOORS.

Figure 2.

Longitudinal Seats.  
(44 Seats.)

The seating arrangement in this car is similar to that used in the Hudson tunnels, the Boston and the Philadelphia subways, and the Brooklyn Bridge cars. Side doors can be introduced in the

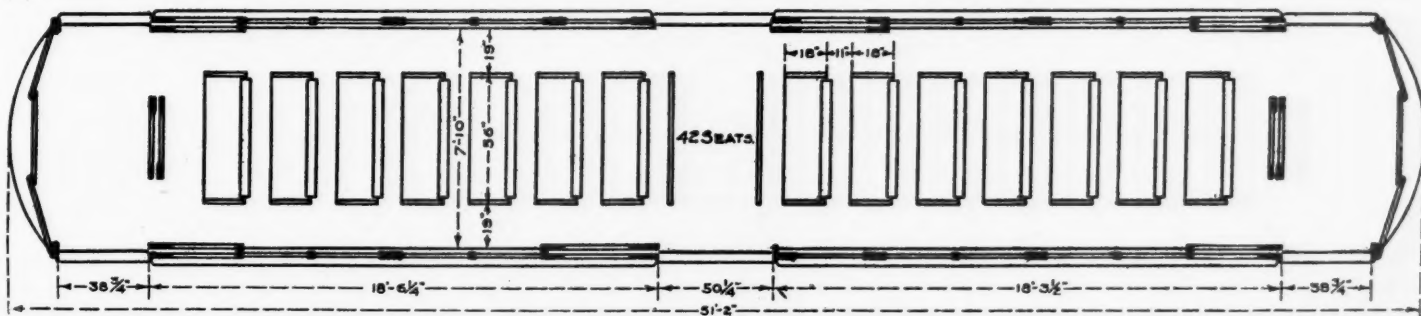


Fig. 4—Car With Central Side Door and End Doors, Using Present Subway Car Body. Cross Seats of "Walk-Over" Type With Two Aisles, 42 Seats.

ing table, which also gives the minimum radius of the platform curves and the width of the open spaces at the center of the car between the platform and side of the car:

Station.	Minimum radius of platform curvature.	Width of spaces bet. car and platform at center of car.
City Hall .....	147 ft.	26 in.
South Ferry .....	191 "	24 "
Fulton St. ....	250 "	16 "
Brooklyn Bridge .....	410 "	12 "
Worth St. ....	480 "	10 "
14th St. ....	485 "	10 "
Times Square .....	452 "	11 "
177th St. ....	470 "	10 1/4 "

At many of these stations, if a central door car were used, it would be necessary to provide a sliding platform similar in operation to the ones used in the Boston subway, and also at the South Ferry station of the Manhattan Elevated. In future subways it is possible to obviate the necessity for these sliding platforms either by avoiding the use of a curved platform or by designing the under framing of the car in such a way that the station platforms could project under the car body. These solutions, how-

present subway cars, as indicated by Fig. 1, which shows the plan of the present car altered to a car with a central side door.

This design contemplates the removal of all cross seats in the present car. A number of partitions can be placed between the seats, as is done in the Hudson tunnel cars, which will compensate in a degree for the removal of the cross seats. The vertical hand rods can be introduced, which will be more convenient for the support of standing passengers than the usual straps. With the circulation idea maintained, the distance which each passenger must move in getting to and from a seat is the same in every case, so that with this car all passengers are treated exactly the same, and there is no advantage of position or comfort to be secured by crowding.

This car allows the most effective arrangement of seats and standing room that can be devised. All seats are equally good, thus removing the objection of having three kinds of seats, as found in the present subway car. The rates of acceleration and retardation in the subway, although rapid, are accomplished smoothly, and very little fault can be found with longitudinal seats, although it

must be admitted that seats of this kind are not as popular as cross seats.

CAR WITH CENTRAL SIDE DOOR AND END DOORS.

Figure 3.

(Using Present Subway Car Body.)

Cross Seats Back to Back with Two Aisles.  
(46 Seats.)

This car combines a car of the central side door type with the style of seating used in the Illinois Central suburban car. Two seats more per car than is provided by the longitudinal seat plan are secured by this arrangement, but at a considerable sacrifice in the efficiency of the standing room. The location of the standing room in the center of the car next to the exit will have a tendency to make passengers "move up in the car." The backs of the seats

forward," which will make it necessary for the train guards to turn the backs of the seats at all stub-end terminals. It will be necessary to limit the space between seats to 29 in. in order to provide a central standing room space as well as a cross-over aisle at each end of the car. If a greater space between seats is allowed, either this standing room must be reduced and the aisle removed, or some of the seats sacrificed. In any event the car cannot be made to compare favorably with the "back-to-back" cross-seat type.

To make the center seat of a bank of three seats acceptable, it must be made easy of access and egress, as the passengers naturally take the outside seats first, which makes it inconvenient to get in and out of the center seat. To use the "walk-over" type of seats, therefore, with two aisles, would practically mean a reduction of seating capacity of this type of car to 36 seats, instead of the 42 seats, shown in Fig. 3. The inefficient use of room, therefore, with

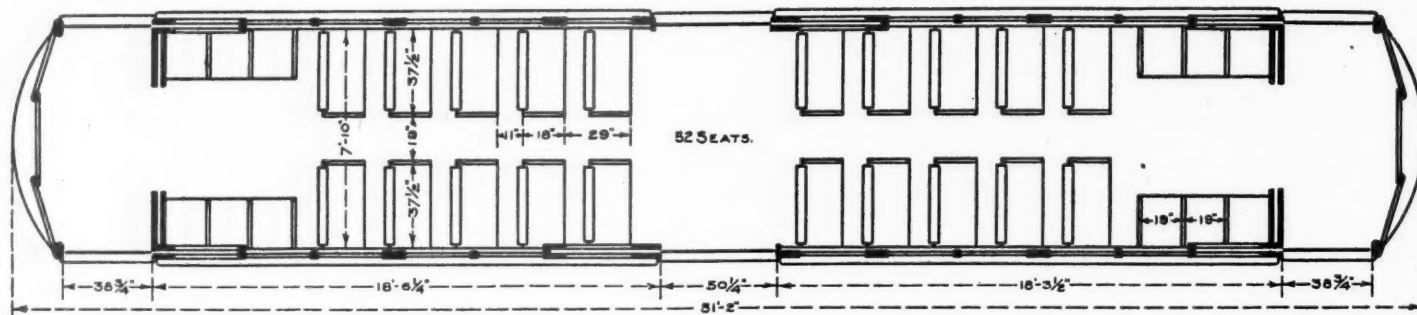


Fig. 5—Car With Central Side Door and End Doors, Using Present Subway Car Body. Cross Seats of "Walk-Over" Type With One Aisle, 52 Seats.

at this point will give something solid to lean against, thus making this standing space somewhat more comfortable than in the longitudinal seat car.

Half of the seats in this car "ride backward," and this may be considered objectionable by some passengers. In the subway, however, riding backward is not as uncomfortable as in a car running in the open. In the subway the eyes are occupied with objects inside the car, while in a surface or an elevated car a disagreeable sensation may be caused to a passenger riding backward by looking at objects which are receding from him. Owing to the use of seats of the "back-to-back type" on the present subway cars, on many of the elevated cars, and on Pullman coaches, the public is becoming educated to ride backward, and the fact that seats of this type do not involve turning over at stub-end terminals gives this arrangement quite an advantage from an operating standpoint.

Owing to the narrowness of the aisles this car is not well adapted for the easy circulation of passengers during rush hours.

CAR WITH CENTRAL SIDE DOOR AND END DOORS.

Figure 4.

(Using Present Subway Car Body.)

Cross Seats of "Walk-Over" Type with Two Aisles.  
(42 Seats.)

In this car all seats are arranged so that passengers can "ride

the "walk-over" cross seats and the extra care required for the operation of seats of this type are objections which would prevent the adoption of such a car.

CAR WITH CENTRAL SIDE DOOR AND END DOORS.

Figure 5.

(Using Present Subway Car Body.)

Cross Seats of "Walk-Over" Type with One Aisle.  
(52 Seats.)

If a single aisle is used a very satisfactory seating capacity with the present subway car fitted with central side doors can be obtained by using cross seats of the "walk-over" type, spaced in the car without reference to the present windows. The seat spacing can be rearranged much better with the seat of the "walk-over" type than with a seat of the "back-to-back" type, as the former is not required to fit the framing of the car.

The average passenger appears to prefer a "front-facing" seat, and this car provides the maximum number of seats of this kind. If a sufficient number of cars could be passed through the subway to keep the standing passengers down to 50 passengers per car, there is no doubt that a car of this type would give excellent satisfaction, but as soon as this car is called upon to carry 100 passengers standing in addition to 52 seated passengers, the congestion in the long, narrow aisle will slow down the movement of passen-

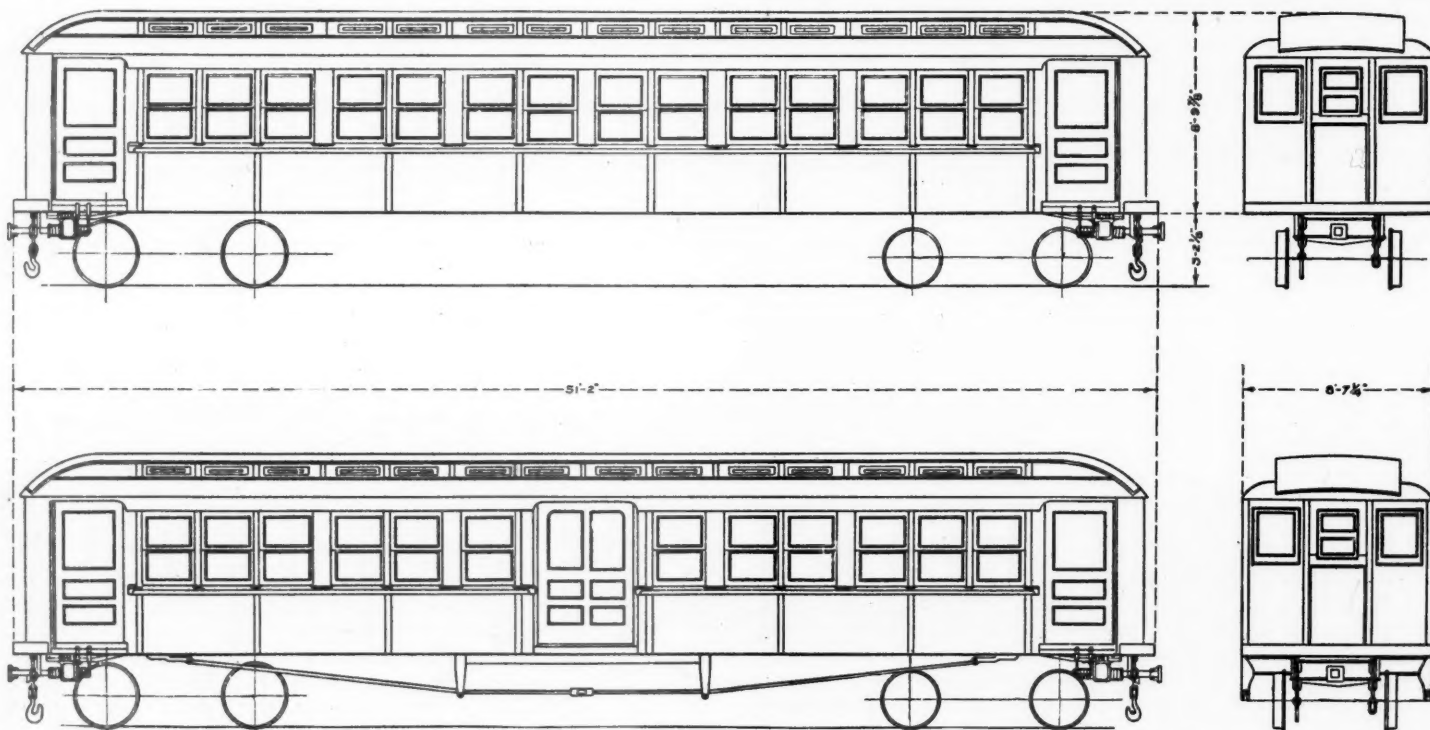


Fig. 1—Present Car Before and After Being Altered to a Car With Central Side Doors.

gers inside the car, and the car would then unload slowly and neutralize the advantages gained by the introduction of the central door.

CAR WITH TWO QUARTER SIDE DOORS.

On roads where the traffic is not as heavy as in the subway, a type of car with two doors, each located about one-fourth the length of the car from the end, is sometimes advocated. This type of car would have as many doors as the present end-door car, but the doors dividing the car into quarters would give the quarter-door car the advantage of providing the shortest average distance from the door to the seat. This car would therefore cause the passengers to occupy the center of the car and thus use the entire length of the car more effectively than it is now used in the present end-door type.

With cars of this type, each door should be of double width,

with this car would be by means of platform railings. At stations where it is desirable to divide the Broadway passengers from the West Farms passengers, as is now done at Grand Central, this type of car would not lend itself to a satisfactory division of the platform space, as the doors would bring the passengers leaving one train in conflict with passengers on the platform waiting for the next one.

CAR WITH QUARTER SIDE DOORS.

Figure 7.

Cross and Longitudinal Seats.  
(48 Seats.)

A certain number of cross seats could be introduced in the quarter-door car, and these cross seats could be placed to advantage in the ends of the car. Such an arrangement would leave the cen-

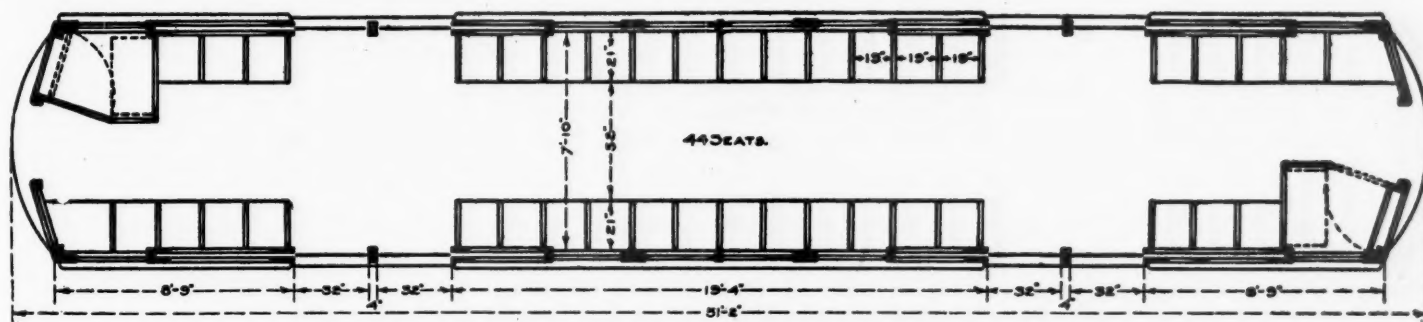


Fig. 6—Car With Two Quarter Side Doors. Longitudinal Seats, 44 Seats.

if it is to accommodate subway traffic, so that two streams of passengers could pass through the doors at the same time; that is, at each quarter of the car there would be practically two doors. The circulation may be provided for by using one set of doors as entrances and the other set as exits. There would be no objection to a division post in the center of the double door with this type of car, as the door openings are large enough to require two separate doors, each of which could close toward the dividing post, and thus do away with the danger of a sliding door opening past the middle post. Owing to the distance of the doors from the end of the car the same difficulties at curved platforms would be met that are encountered with the center door car.

The location of the train guards would be a problem with this type of car, as these guards could not work to advantage from between the cars as at present. If the guards are moved into the car their most effective location would be at the center of the side of the car, from which position they could not only control the movement of the doors but also encourage the circulation of the passengers from the rear toward the front exit door.

CAR WITH TWO QUARTER SIDE DOORS.

Figure 6.

Longitudinal Seats.  
(44 Seats.)

It would be difficult to alter the present car frame so as to introduce the wide doors shown in Fig. 6 without making the car considerably heavier than at present or sacrificing its structural strength, and this latter expedient would not be advisable.

Except for the fact that all the passengers entering one car

tral part of the car free, so as to provide the two open standing spaces contiguous to the entrance and to the exit doors. The location of the cross seats with the one central aisle at both ends of the car leaving the two standing spaces near the doors connected by a broad aisle between the longitudinal seats in the center of the car, is an arrangement which should materially assist the circulation in the car from entrance to exit. Passengers who are slow in leaving the cross seats in the rear of the car would no doubt have some trouble in reaching an exit, as they would encounter the stream of entering passengers.

Either type of cross seat could be used with this car, though there is some preference for the "back-to-back type," as the back of such seats would present a substantial support convenient to the door openings. The vertical post idea could be advantageously used to make the standing room in this car comfortable.

If future subways could be built sufficiently in advance of the demand for them, this type of car could be used to good advantage, and cross seats could be substituted for longitudinal seats. Under present conditions, however, there would be a temptation to move in the other direction and fold up the longitudinal seats during rush hours, thus providing increased standing capacity.

CARS WITH THREE DOORS NEAR CENTER.

The objections to a car with a central side door, on account of the difficulty which might be experienced by the train guard in controlling the center door from his position between the cars, could be removed by locating the end doors nearer a central door, thus providing practically a large door in the center of the car with two smaller doors, one between the center and each end of

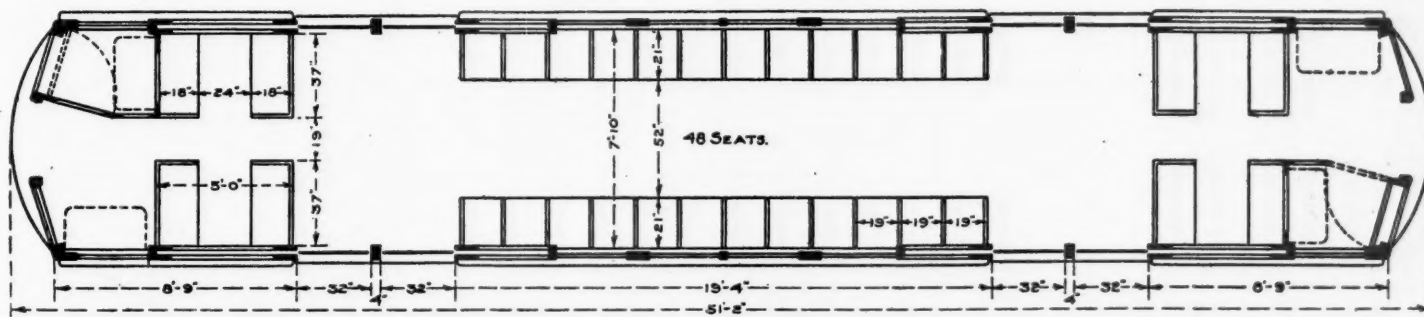


Fig. 7—Car With Quarter Side Doors. Cross and Longitudinal Seats, 48 Seats.

must gather at one place on the platform, and that, therefore, the inevitable crush would take place in loading, this type of car has many advantages. This car, however, would work much better during non-rush hours than during rush hours. It would be difficult to maintain a circulation of passengers in one door and out the other as soon as the space in the car between the doors became filled with standing passengers. As soon as passenger on the platforms desiring to enter the car became blocked at a time when the exit doors were empty and open, there would be a rush to board the car through the exit doors, as has been proven by the experience with the Boston public. The only way to control the circulation

the car. This arrangement would also be an improvement over the quarter-door car, as with three doors the moving passengers would be divided into three groups instead of two.

This car should be provided with a separate guard for each car, and this guard should be located so that he could see along the side of the car in one direction, and thus be in a position to quickly close all doors at once.

A circulation with this car can be set up in either direction. In maintaining a circulation, however, this car would not have the advantage of a space such as a platform which could be cleared of passengers while moving between stations, so as to provide an

opening space for the entering passengers, as with cars of the end-door type.

The door openings being on the center and near the quarter lines of the car, would lend themselves conveniently to an effective system of platform guard rails, but the center door would be a disadvantage at curved platforms.

CAR WITH THREE DOORS NEAR CENTER.

Figure 8.

Longitudinal Seats.  
(44 Seats.)

This car is similar to the present end-door car fitted with an additional center side door, with the exception that the end doors are located much nearer the central door. The nearer these end

culties of adapting the present car frame to this design, are serious disadvantages to the use of a car of this type with the present subway.

CARS WITH MULTI SIDE DOORS.

Cars of this type are in successful use in the suburban service of the Illinois Central in Chicago. These cars are 72 ft. long over all, and 10 ft. 6 in. wide over the sheathing. There are 12 sliding doors on each side, opening on a level with the platform, and two doors on each side, opening to steps which are used at stations where there are no high platforms. There are end doors, so that passengers may pass from car to car in the train, and the cars are not provided with extension platforms.

The doors are operated by the train guard from the inside of the car, the operating mechanism being designed so that when the

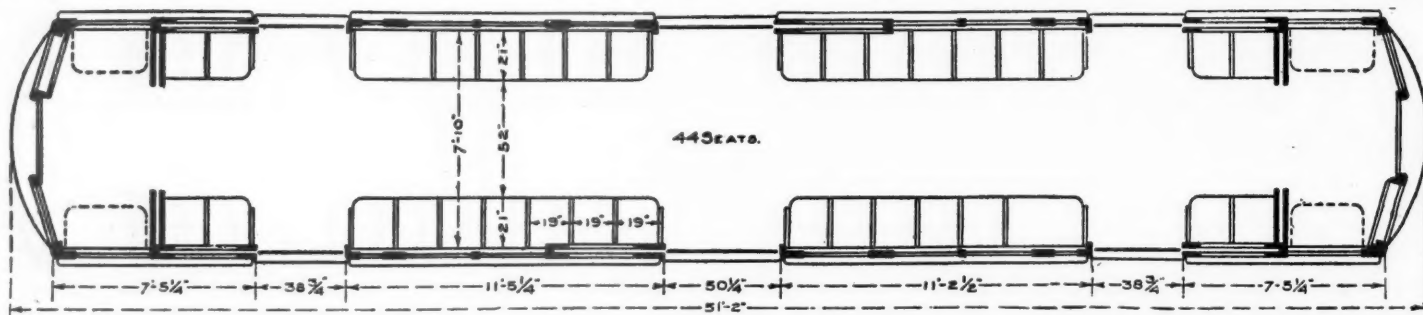


Fig. 8—Car With Three Doors near Center. Longitudinal Seats, 44 Seats.

entrance doors are brought to the central exit door, the easier will it be to maintain a circulation in and out of the car through the separate doors.

The location of the end doors at the quarter division points of the car, or even nearer to the central door, is practically the only way that the central door can be used with success in the subway, as a comparatively easy means of reaching the exit must be provided. Otherwise a passenger boarding a car when it is crowded will either find it impossible or will refuse to crowd his way through the standing passengers in the car in order to reach the regular exit, and will insist on leaving the car by the door he entered. As soon as one exemption is allowed to the rule of "in one door and out the other," confusion will at once take place, and the advantage of having the passengers move together in a predetermined way without hesitation will be lost.

This car lends itself to the longitudinal seat plan throughout its length, as there is not enough space in the ends of the car for cross seats, and it would be a mistake to limit the connecting space between the doors by the introduction of an aisle or aisles serving cross seats.

CAR WITH THREE DOORS NEAR CENTER.

Figure 9.

Combination of Cross and Longitudinal Seats.  
(44 Seats.)

In order to make room for cross seats in the ends of a car of this type, and at the same time provide the shortest distance pos-

sible between the entrance and the exit doors, the easier will it be to maintain a circulation in and out of the car through the separate doors. Before starting from the station the movement of the operating wheel by the guard in the reverse direction closes the doors which have been opened, and at the same time locks all the doors. When the edge of the door is within 3 or 4 in. of the jamb it stops, and then moves slowly forward to the closed position, the purpose of this being to allow any passenger who may be caught in the door to move aside. An electric signal apparatus is connected with the doors so that a signal is automatically transmitted to the engineer when the last door in the train is closed.

Seats are provided for 100 passengers, 50 facing in each direction, and there is an aisle on each side of the car between the seats and the doors so that passengers entering any door may pass down the aisle to any seat. The seats were originally all of wood, but were found to be uncomfortable, and were changed to rattan. In general, this car has given satisfaction, the principal objections apparently being in regard to the size and the shape of the seats and their arrangement in the car. Some objection is also made to the lack of ventilation in the summer. The problem of heating the cars in winter has not proven to be a serious one, as ample steam coils taking steam from the locomotive are provided under each seat. Under subway conditions it would be better to have the door mechanism designed so as to open all the doors simultaneously, as some delay is now occasioned by passengers hesitating to open the doors.

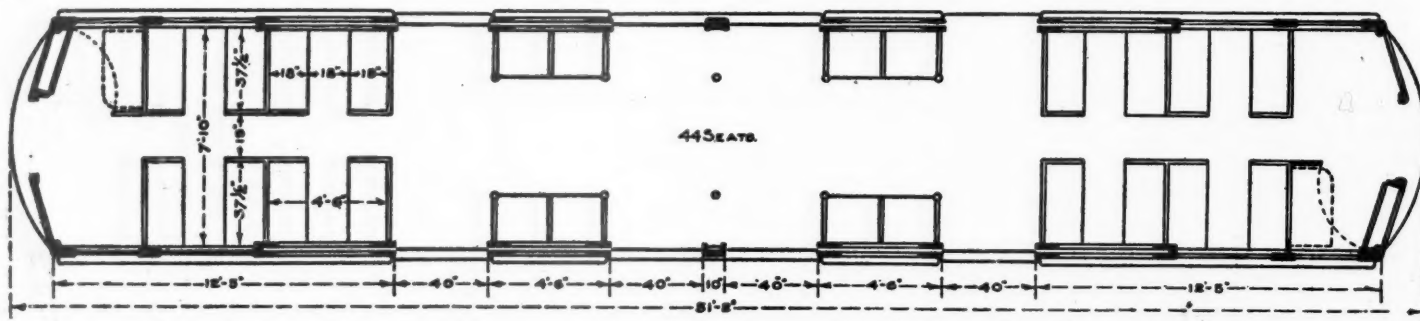


Fig. 9—Car With Three Doors near Center, Combination of Cross and Longitudinal Seats, 44 Seats.

sible between the entrance and the exit doors, a large double door may be placed in the center of the car, to be used for an entrance, and two smaller doors at each side to be used for exits.

The circulation in this car would be in the opposite direction to that shown with any of the other cars. The passengers would gather at one place on the station platform ready to enter this car, and would quickly pass through the large double doors. The passengers leaving the cars from the cross seats would not encounter a stream of entering passengers.

The seating capacity of this car is liberal, and the location of the standing room is convenient and efficient. All the doors can be controlled by a guard centrally located where he can see the moving passengers, and to a large extent control their movements.

The troubles with the curved platforms, and the structural diffi-

THE MULTI SIDE-DOOR CAR AND THE PRESENT SUBWAY.

The present length of the subway cars would allow for a maximum of 8 side doors, or for four times as many doors as at present. The present end doors, each about 38 in. wide, or a total door area of 76 in. for each side. With 8 side doors, each 25 in. wide, there would be a door opening of 200 in. per car, or nearly three times the door space provided in the present car. The best that could be expected of the multi side-door car, as far as reducing the time required at present for unloading and loading the passengers is concerned, would be to have this time cut down to one-third the present amount.

In order to determine the efficiency of this type of car I have had a large number of observations made of the Illinois Central car in actual operation. The density of traffic on the Illinois

Central suburban line at Chicago does not compare with the density of traffic in the subway, and therefore a conclusion from a comparison of the movement of passengers must be drawn with caution. During rush hours in Chicago the maximum number of passengers passing through the 12 doors of the car was found to be 4.8 per second, and, in making this observation, care was taken to include only the time between the opening and the closing of the doors, so as to eliminate the variable time required for giving the starting signal and in starting the train. It should be borne in mind that the Illinois Central cars are over 72 ft. long, and this result was obtained with 12 doors, and not with 8 doors, which is the greatest number possible for the 50-ft. subway car.

It is fair to assume, therefore, that with the 8-door car in the subway, passengers would be unloaded and loaded at the rate of

the corresponding period, and experience in the subway has demonstrated that in order to close the car doors during the rush period a corps of uniformed, trained platform guards, in addition to the train guard, is absolutely necessary.

It has further been learned that the only way to move trains through the subway on schedule time is to close the car doors promptly, and thus limit the platform delays. It is difficult to see how this could be accomplished with the multi side-door car unless the stream of passengers was stopped before it reached the loading platform. This would transfer the "crush" from the platform in the vicinity of the car doors, as at present, to a platform entrance or a number of entrances, which could be made sufficiently large to considerably reduce the crowding, but the inevitable cutting off of the stream of passengers must be quickly accomplished in

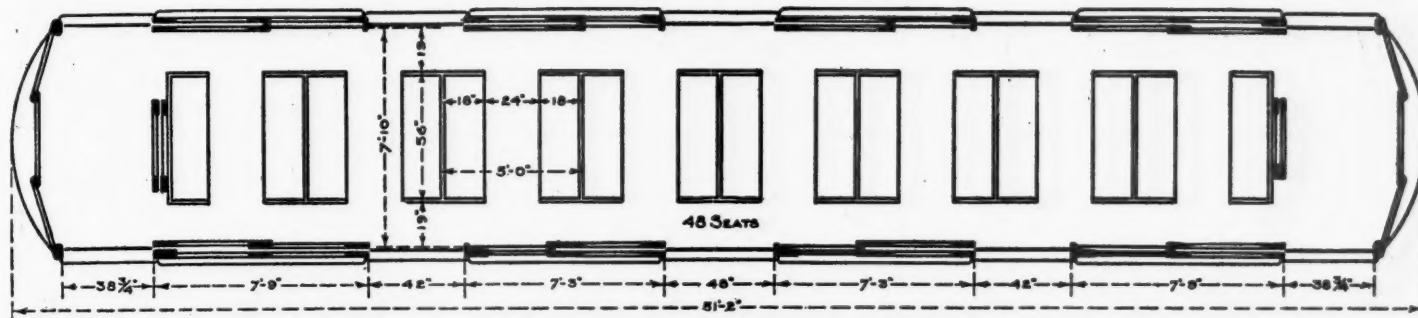


Fig. 10—Car With Multi Side Doors. Cross Seats Back to Back With Two Aisles, 48 Seats.

not more than 4 persons per second per car. As a result of a great many observations of the present rate of passenger movement in and out of the present cars during rush hours in the subway, I find that this rate does not vary far from 1 person per second per door, or at the rate of 2 passengers per second per car, except under extremely congested conditions, when the rate becomes slightly less. During slack periods passengers readily pass in and out of the car doors at this rate, while during rush hours the station platform attendants facilitate the movement, which would ordinarily be considerably reduced by the congestion, and the prompt closing of the doors by the uniformed attendants at the busy stations goes far toward making it possible to load the cars at the rate of 2 persons per car per second, except during the very busiest periods.

At the Borough Hall station of the Brooklyn extension, recently opened, this rate is often increased to an average of  $2\frac{1}{2}$  passengers per car per second for the first 30 seconds of loading, but at this station at the present time there exists only terminal conditions without the conflict of transferring traffic.

It would be impracticable to provide a platform attendant for each door of the multi side-door car. It is therefore necessary, in considering the effect of a car of this type on the length of station waits during rush hours, to compare the operation of the multi side-door car without the advantage of a station platform attendant at each door to assist in the loading of the passengers, to the

some manner, in order to allow the prompt movement of the trains. If the multi side-door cars were to be adopted for the subway, the stations should be arranged so as to control the passenger flow before it reaches the train, as it would be found exceedingly difficult to cut off the passengers at 64 separate places, which would result from the use of 8 doors in each car of an 8-car train.

The introduction of the transfer system, which furnishes a possible saving of a minute or two as a reward for considerable pushing and crowding, has driven a number of the regular subway passengers "minute mad." To deprive these patrons of an opportunity to catch a train by closing a station gate in their faces at the time the train pulls into the station would meet with considerable objection if attempted in the present subway, where the stations are not built to provide for the comfortable carrying out of this arrangement, but the suggestion should be borne in mind in connection with the design of future subways. The only logical place to cut off the flow of passengers is at the entrance to the station platforms, and not at the doors of the cars, a fact which is demonstrated by the design of steam railroad passenger stations and ferry-boat waiting rooms.

To allow the successful use of the multi side-door car would make other changes necessary, particularly with the station platforms. The present platforms serve only one of the end doors of each of the end cars of the train. To get the full advantage of all of the doors along the entire length of the train it would be

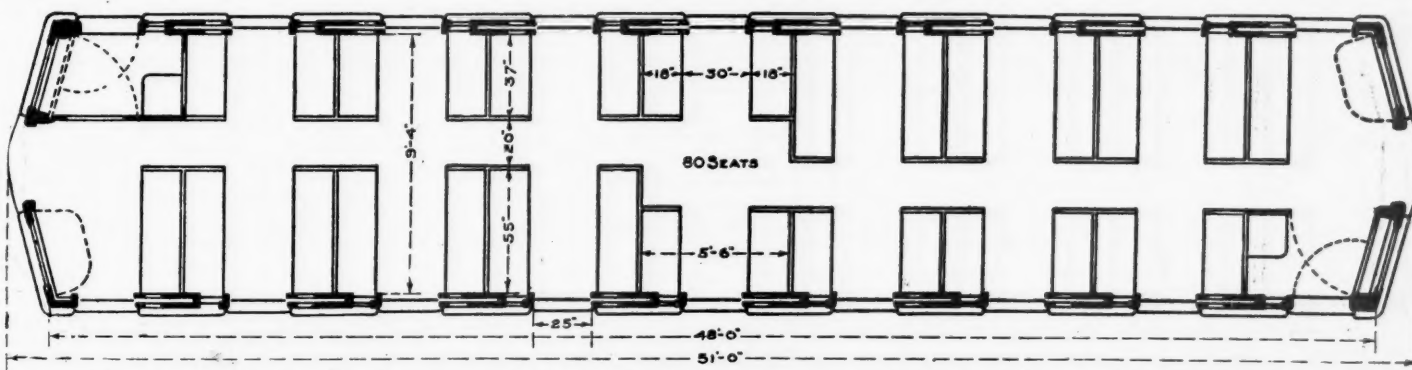


Fig. 11—Car for Future Subways With Multi Side Doors and Cross Seats Back to Back With One Aisle, 80 Seats.

operation of an end-door car with a platform guard to not only expedite the movement of passengers, but also to assist in closing the doors. With this comparison in mind it is difficult to see how the use of the multi side-door car in the subway would reduce the present time of loading and unloading by more than one-half; that is, the present rate of passenger movement of 2 persons per car per second maintained with the present end-door car might possibly be increased to 4 passengers per car per second with the multi side-door car.

This result could only be obtained upon the assumption that all of the multi side doors could be promptly closed by the train guards. In Chicago there is apparently no difficulty in doing this, but it should be remembered that during rush hours the subway traffic is fully 10 times as large as the Illinois Central traffic during

necessary to extend both the express platforms, which are 350 ft. long, and the local platforms, which are 200 ft. long. This requirement would mean a 50-ft. extension on 38 separate platforms south of 96th street, as well as the extension of a number of platforms north of 96th street, and in some cases this alteration under running conditions would be an expensive and exceedingly difficult piece of work.

The final serious objection to the multi side-door car in the present subway is the fact that practically the entire car bodies now in use would necessarily either be scrapped or used elsewhere, as it would be practically impossible to rebuild them so as to provide 8 side doors on each side of each car. Under these circumstances, the cost of the change would mean an expense of at least \$5,000,000 for multi side-door cars, and of about \$2,000,000 for plat-

forms, and, in my opinion, the improvement to be expected from these changes with the present subway would not justify the investment.

#### MULTI SIDE-DOOR CARS AND FUTURE SUBWAYS.

If the multi side-door car is to be considered for future subways, the station platforms should be arranged so that the unloading can be done on one station platform, and the loading can be accomplished from another and separate platform. Such an arrangement would necessarily contemplate some inconvenience to the passengers transferring from one service to the other, and the adoption of the separate platform idea would make impossible the use of the island platforms which, under present arrangements, often serve both the express and the local trains, an arrangement

#### CAR WITH MULTI SIDE DOORS (FOR FUTURE SUBWAYS).

Figure 11.

*Cross Seats Back to Back, with One Aisle.*  
(80 Seats.)

This design has the advantage of one aisle instead of two, and is 18 in. wider than the present car, thus at once increasing the possible seating capacity, and this general arrangement of seats will, therefore, be found the most efficient way to carry out the policy of attempting to provide a seat for every long-haul passenger. The free space between the seats has been increased to 30 in. in an attempt to provide room for the passengers entering and leaving the car to pass by the seated passengers with the minimum amount of annoyance.

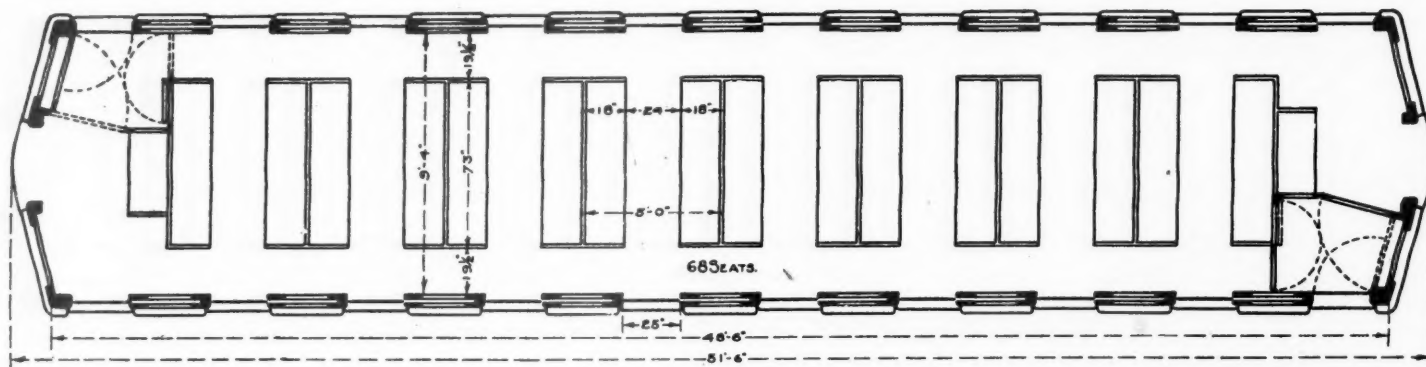


Fig. 12—Car for Future Subways With Multi Side Doors and the Illinois Central Type of Seat, 68 Seats.

which contributes greatly to the convenience of those using the transfer privilege. To make the changes necessary to provide separate platforms for the present subway and at the same time keep the trains in operation on a schedule which calls at frequent intervals for a train on each of the four tracks every two minutes, would be so difficult as to make its cost unjustifiable, and the suggestion, therefore, can only be used in considering an entirely new subway. These remarks apply as well to the straightening of the platforms. The curves of the present platforms would seriously interfere with the operation of the multi side-door car. Sliding platforms, or extension platforms on the cars, to correct this defect are at best complicated and unsatisfactory expedients, and as long as with future subways a different station arrangement and separate platforms would be necessary to make a success of the multi side-door car, it would add little to the station requirements to specify that if multi side-door cars are to be used, the station platforms should be free from curves.

#### CAR WITH MULTI SIDE DOORS.

Figure 10.

*Cross Seats Back to Back, with Two Aisles.*  
(48 Seats.)

This plan indicates the introduction of three wide doors in the sides of the present subway cars and the rearrangement of the

This car ought to work well with a load not exceeding 100 passengers, 80 of whom would be seated, but would prove exceedingly uncomfortable if the standing passengers began to encroach upon the space between seats. As the space between seats is sufficient to allow passengers to pass between the knees of those seated, and is the only avenue of entrance and exit, this space would naturally be occupied by standing passengers, particularly during rush hours, much to the inconvenience of the seated passengers, and this is the penalty that must be paid for maximum seating capacity.

There are 8 doors in each side of this car, but the absence of free space near each exit and entrance will cause this car to be loaded and unloaded slowly, and the advantage of the extra number of doors will disappear just at the time that this feature would be of the greatest use.

#### CAR WITH MULTI SIDE DOORS (FOR FUTURE SUBWAYS).

Figure 12.

*The Illinois Central Type of Seat.*  
(68 Seats.)

This design shows a car 18 in. wider than, and of the same length as present car, with seats in banks of four on 5-ft. centers, which spacing will allow the same number of passengers per foot length of car as is found with the Illinois Central cars. There is a door opening between each set of seats, making eight doors along

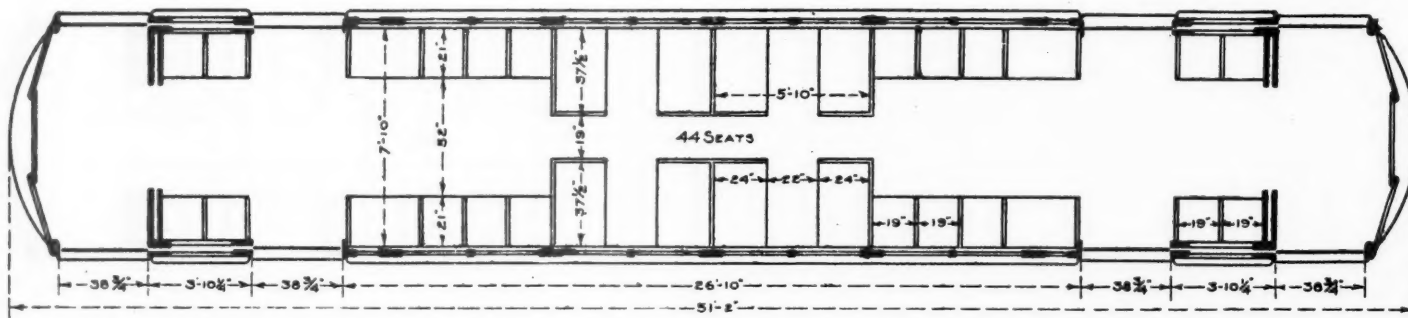


Fig. 13—Car With Double Doors near Ends, Combining Cross and Longitudinal Seats, Using Present Car Body and Seat Spacing, 44 Seats.

seats in accordance with Illinois Central plan. With this car no attempt would be made to set up and maintain a circulation, and every door would be used as a combined exit and entrance. While this car would lessen the conflict of passengers at the car doors it would not provide a means of entirely removing this cause for discomfort.

At least two platform attendants for each car would be necessary during the busy hours, to assist the train guard in cutting off the stream of passengers entering the car and to aid in closing the car doors. The car platform space would be available for passengers preferring to ride on the platform, as with this car it would not be necessary to enforce the rule that passengers must not ride on the car platforms.

the side of the car. The two aisles are made a little wider than in the Illinois Central car, and the seats are more comfortable, although the free space between opposite seats has been reduced from 27 in. to 24 in., in order to make each seat deeper.

The car is contemplated only for future and larger subways, as it would be impracticable to rebuild the present cars to allow for the extra width necessary for the four cross seats shown and operate them in the present subway.

The advantages of this type of multi side-door car, although many, are not as great as would at first appear, owing to the delay which would be caused by passengers searching for seats before they selected an entrance and entered, and the conflict of entering passengers with those who would have already entered the car and

would be using the aisles for the purpose of finding seats. For subway use all doors should be operated at once by the car guard, in order to reduce the delay which is sometimes experienced in Chicago, due to the hesitation of inexperienced passengers in opening the doors.

#### CARS WITH DOUBLE DOORS NEAR ENDS.

Several different seating arrangements possible with cars having double doors near the ends are shown and discussed below:

#### CAR WITH DOUBLE DOORS NEAR ENDS.

Figure 13.

#### Combining Cross and Longitudinal Seats. (44 Seats.)

#### Using Present Car Body and Seat Spacing.

This design contemplates taking out eight of the longitudinal seats in the present car and introducing four extra exit doors. The design, which is the same as shown in the drawing previously published of the recommended type of the present subway car altered to a car with double doors near ends, shows the most effective change that, in my judgment, can be made with the present subway car, as it introduces the extra doors at places where the framing of the present car and the arrangement of the present seats will be the least disturbed.

When the first consignment of subway cars was built the end doors were only 29 in. wide, but the operation of the cars soon proved this narrow door width to be a mistake, and the doors were widened to 38 in. While this width is not sufficient to allow passengers to pass through the doors two abreast, it is found that they naturally stagger themselves and pass through the door much faster than if they were forced to move in single file. As soon as the doors are made much wider, as in the Brooklyn Bridge shuttle cars, the crowding passengers make an effort to pass through the door three abreast, much to the discomfort of the middle passenger. To avoid this difficulty a dividing post in the center of a wider door might be introduced, but with a sliding door for cutting off the flow of passengers this center post would serve to multiply the danger and increase the accidents. The new

carrying capacity per lineal foot of car, an increase not practically obtainable in any other way.

The widening of the car could be carried to any reasonable degree, but in Fig. 14 it is designed to allow for five seats abreast. The 60-in. spacing of the seats will provide convenient access to the inside seats. There is but one aisle, the width of which is ample and the standing room is convenient to the exit. During rush hours this standing space can be increased by folding up the longitudinal seats, each of which can have a ledge arranged to provide a comfortable support for part of the standing passengers. Vertical posts can be conveniently located so as to guide and support the passengers standing in the open spaces at the end of the car.

#### SUMMARY OF TYPES OF CARS.

The various types of cars which approximate fulfilling the requirements for present and future subway service are as follows:

1. Car with central side door and end doors (Fig. 5).
  - (a) Longitudinal seats (Fig. 1).
  - (b) "Back-to-back" cross-seats, with two aisles (Fig. 2).
  - (c) "Walk-over" seats, with two aisles (Fig. 3).
  - (d) "Walk-over" cross-seats, with one aisle (Fig. 4).
2. Car with two quarter side doors.
  - (a) Longitudinal seats (Fig. 6).
  - (b) Cross-seats (Fig. 7).
3. Car with three doors near center.
  - (a) Longitudinal seats (Fig. 8).
  - (b) Cross-seats (Fig. 9).
4. Car with multi side doors.
  - (a) "Back-to-back" cross-seats, with two aisles (Fig. 10). Using present car frame.
  - (b) "Back-to-back" cross-seats, with one aisle (Fig. 11). For future subways.
  - (c) Illinois Central type of seat (Fig. 12). For future subways.
5. Car with double doors near end.
  - (a) Combination of cross and longitudinal seats (Fig. 13). Using present car frame and body.

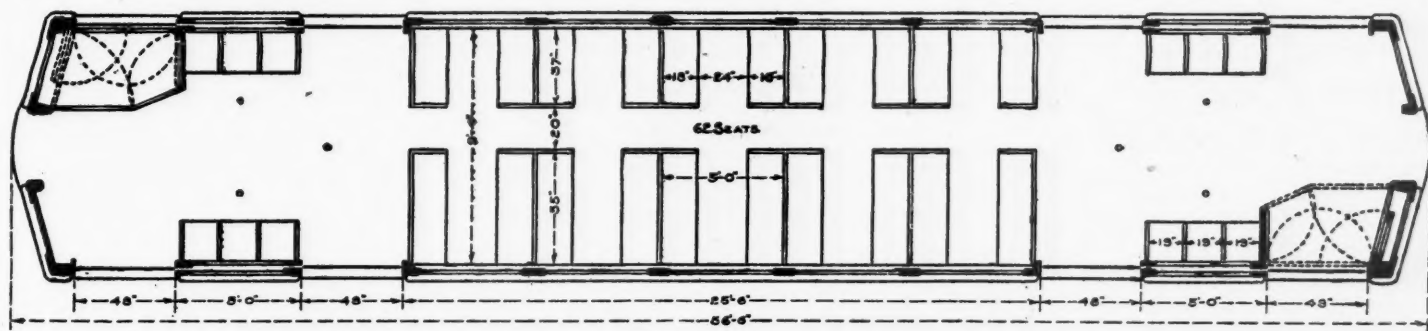


Fig. 14—Car for Future Subways With Double End Doors. Back to Back Seats on 60-in. Spacing, 62 Seats.

doors have, therefore, been shown of the same width as the redesigned doors of the present car.

#### CAR WITH DOUBLE DOORS NEAR ENDS.

Shown last week.

#### Combination Cross and Longitudinal Seats. (48 Seats.)

#### More Compact Seats for Future Cars in Present Subway.

This is the recommended future car for the present subway, a drawing of which was shown in the previous article. In the present subway cars the space devoted to the cross seats is used in an uneconomical manner. There are 70 in. between the center of the backs of these seats, which is taken up by two 6-in. back cushions, two 18-in. seats and a clear space between seats of 22 in. Where space is as much at a premium as it is in the subway cars, the arrangement of these seats should be made more compact, and this can be done without sacrificing the comfort now secured with the more liberal spacing. For double side seats, served from a center aisle, a clear distance of 20 in. between seats is sufficient, and the allowance of 18 in. for each seat, together with its back, has been found satisfactory, thus making a total over-all distance of 56 in. for one bank of seats. The width of 18 in. for each passenger for the cross seats and of 19 in. for the longitudinal seats in the present car is good practice. With the more economical arrangement of cross seats, more space can be devoted to such seats and at the same time the seating capacity of the car can be increased. This improvement should be kept in mind in ordering future cars for the present subway.

#### CAR WITH DOUBLE END DOORS (FOR FUTURE SUBWAYS).

Figure 14.

#### Back-to-Back Seats on 60-in. Spacing. (62 Seats.)

As it is probable that future subways will be larger than the present one, the cars can be made wider, and thus increase the

- (b) Combination of cross and longitudinal seats (drawing shown in previous article). Using more compact spacing of seats; for future cars for present subway.
- (c) Combination of cross and longitudinal seats (Fig. 14). Wide car for future subways.

Wider cars containing 60 seats and run in 10-car trains at the rate of 40 trains per hour will provide 24,000 seats per hour on one track. The capacity of the express tracks in the present subway is 52 seats per hour in 8-car trains which pass limiting stations at the rate of 30 trains per hour, or 12,480 seats upon one track. In other words, future subways may have twice the seating capacity of the present subway, as now operated.

#### Depths of the Principal Harbors of the World.

**New York.**—The approach to the harbor when completed will have a depth at low water of 40 ft.

**Boston.**—The depths of the approaches are being increased from 36 ft. to 44 ft. at high water. The variation of the tide is 10 to 11 ft.

**Baltimore.**—Present depth 29 ft. 6 in. at h. w., to be increased to 36 ft.

**Newport News.**—To have a depth of 36 ft.

**New Orleans.**—The channel is to be dredged to a depth of 36 ft. h. w.

**San Francisco.**—Thirty-one ft. l. w., 36 ft. 6 in. h. w.

**London.**—The Thames has a depth of scant 28 ft. l. w. The docks are separated from the river by locks. The dock entrances at Gravesend have a depth of 25 ft. 8 in. l. w. and 44 ft. h. w. It is intended to increase the depths to 29 ft. 6 in. l. w. and 48 ft. h. w.

**Southampton.**—Twenty-nine ft. to 31 ft. l. w. spring tide, with 14 ft. 9 in. rise of tide.

**Liverpool.**—The channel in the Mersey has a width of 1,475 ft. with 27 ft. depth at l. w. Rise of tide 19 ft. 6 in. to 26 ft.

**Plymouth.**—Has a natural depth of 30 ft. l. w., 42 ft. h. w.

**Havre.**—Depth of dredged channel to deep water 35 ft. 6 in. The lock to the principal basin, Basin Bellot, is 99 ft. wide, with 35 ft. over the sill at h. w.

**Antwerp.**—The depth of the Schelde and of the harbors is planned for 24 ft. 6 in. l. w. and 38 ft. h. w.

**Rotterdam.**—The minimum depth of the channel to the sea, when completed, 24 ft. 6 in. l. w., 29 ft. 6 in. h. w.

**Amsterdam.**—After completion of the improvements to the North Sea canal, its minimum depth will be 32 ft., which can be increased to 33 ft. 6 in.; the minimum width of bottom 164 ft., with a lock 738 ft. x 82 ft. x 32 ft. 5 in. The depth of the outer harbor, Ymuiden, is 37 ft. h. w.

**Bremen and Bremerhaven.**—Bremerhaven is the port of Bremen, and extensive dredging operations have secured a channel in the Weser to the sea 26 ft. 3 in. deep at l. w. and 37 ft. at h. w. The principal harbor basin, the Kaiserhafen, has an entrance lock 732 ft. long, 92 ft. wide, with 34 ft. 8 in. depth at the sill at h. w. Since 1888 the fairway of the Weser to Bremen has been deepened to 14 ft. l. w. and 18 ft. h. w.

**Hamburg.**—Previous to 1902 the fairway in the Elbe was 27 ft. at h. w., compelling the largest vessels to lighter at Cuxhaven or at Brunshausen. Dredging has increased the depth to 32 ft. 9 in. at h. w. As this is barely sufficient for present requirements, extensive improvements on the lower Elbe are contemplated.

**Genoa.**—Depth in the harbor 52 ft.; alongside quays 29 ft. 6 in.

**Naples.**—Depth in the harbor 111 ft.; alongside quays 32 ft. 6 in.

**Calcutta.**—Twenty-seven ft. at h. w.

**Bombay.**—Twenty-nine ft. 6 in. at h. w. Rise of tide 8 ft. 6 in.

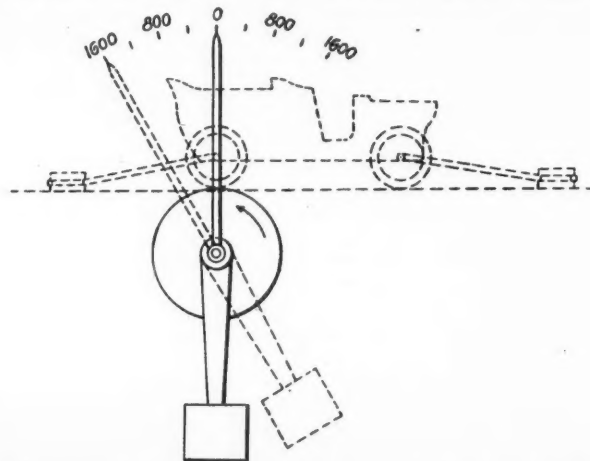
**Colombo.**—Thirty-six ft. at h. w. Rise of tide 2 ft.

**Hong Kong.**—Thirty-nine ft. at h. w.

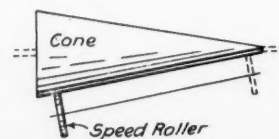
**Yokohama.**—Thirty ft. 6 in. at l. w., 35 ft. at h. w.

### An Automobile Dynamometer.

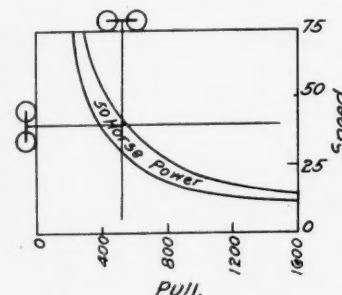
The Automobile Club of America has learned a lesson from the locomotive testing plants and has had a dynamometer designed for testing automobiles in the same manner that similar work has been done with locomotives at Purdue and by the Pennsylvania Railroad. Owing to the fact that but one pair of wheels has to be provided for, the mechanism is, of course, much simpler than that of the locomotive machine. It is the first and only one of its kind, and is arranged to show at once the speed in miles per hour and feet per



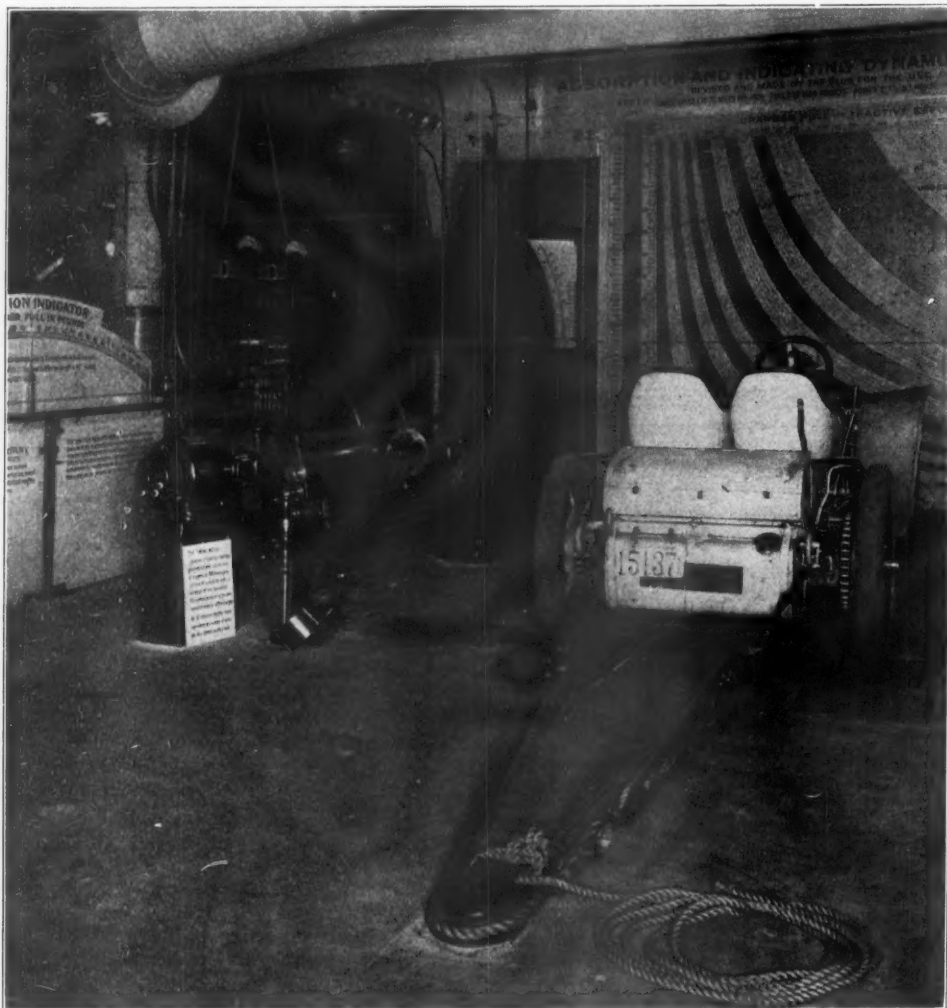
Pendulum Dynamometer; Automobile Testing Plant.



Speed Roller and Cone.



Speed and Power Diagram.



Automobile in Position for Records.

**Nagasaki.**—Twenty-one ft. to 121 ft. l. w.

**Sydney.**—Thirty-four ft. h. w. Rise of tide 5 ft.

**Melbourne.**—Thirty ft. h. w. Rise of tide 3 ft.

**Rio Janeiro.**—Fifty ft.

**Capetown (Table bay).**—Thirty-four ft l. w., 39 ft. h. w.

In this connection the following is also of interest:

**Suez Canal.**—On completion of the work in progress, depth will be 33 ft. 9 in. width at bottom 1,083 ft., so that in this year vessels with a draft of 27 ft. 9 in. can be admitted.

**Panama Canal.**—The projected depth is 40 ft.; minimum width of bottom 150 ft.

second; the tractive effort, horse-power of motors, grade climbing ability and braking power.

It is also provided with an electric fan for catching the exhaust from the automobile in order that the air in the room may be kept clear of smoke and other products of combustion.

It was designed for the club by Dr. S. S. Wheeler, and is an assemblage of power absorbing and measuring instruments and a large power chart with automatically operated pointers.

The car is held in place by cables, and the driving wheels are carried by drums as in the case of the locomotive testing plant. Instead of the hydraulic brakes the motion of the drums is resisted by a pendulum hanging below the floor and attached to the drum shaft, not rigidly but by means of a frictional resistance that can be varied. This pendulum then swings out from its vertical position according to the pull exerted by the car upon the drums. This is indicated by a pointer attached to the pendulum and reaching above the floor. The indications thus obtained are transferred to a ruler traveling across the face of a large chart.

The speed of the car is obtained by moving another ruler vertically across the chart by means of a special piece of apparatus.

A cone is revolved by an electric motor at constant speed. To verify this speed, a bell, attached to the cone, shaft, rings at each 100 revolutions, or at intervals of 30 seconds. A wheel or roller, driven by the automobile and therefore revolving slowly or fast to correspond, rolls upon the surface of the cone and is pulled, by

an independent motor, back and forth between the small and large ends of the cone until it finds the point where it does not slip because that portion of the cone presents the same speed as the roller. This longitudinal adjustment of the roller is transmitted by a wire cable to the speed ruler on the chart, and the power required for moving the ruler is thus made independent of the automobile. The roller, driven by the car if running at 60 miles per hour, must be drawn to a position near the large end of the cone in order to run with the cone. Whereas, if the car drives the roller at only five miles per hour, it must be drawn to a position near the small end of the cone. A system of electric contacts is arranged with a motor to shift the roller automatically until it finds the point where it will roll on the cone without slipping.

The speed and power rulers are thus moved across the chart automatically to correspond with the speed and the tractive effort or pull that the dynamometer shows the car is making.

On the board are painted the horse-power corresponding to each different speed and pull so that the result at each moment can be read at a glance and without calculations.

The chart is on a heroic scale and can be read easily by the driver of the car. The speed of the car may be read from the chart

duction of the Donez coal mines increased 2,115,000 tons, which is more than 20 per cent. In fuel value this increase in coal is about equivalent to four times the decrease in petroleum consumption on these six railroads.

#### Penalty Laws in the South.

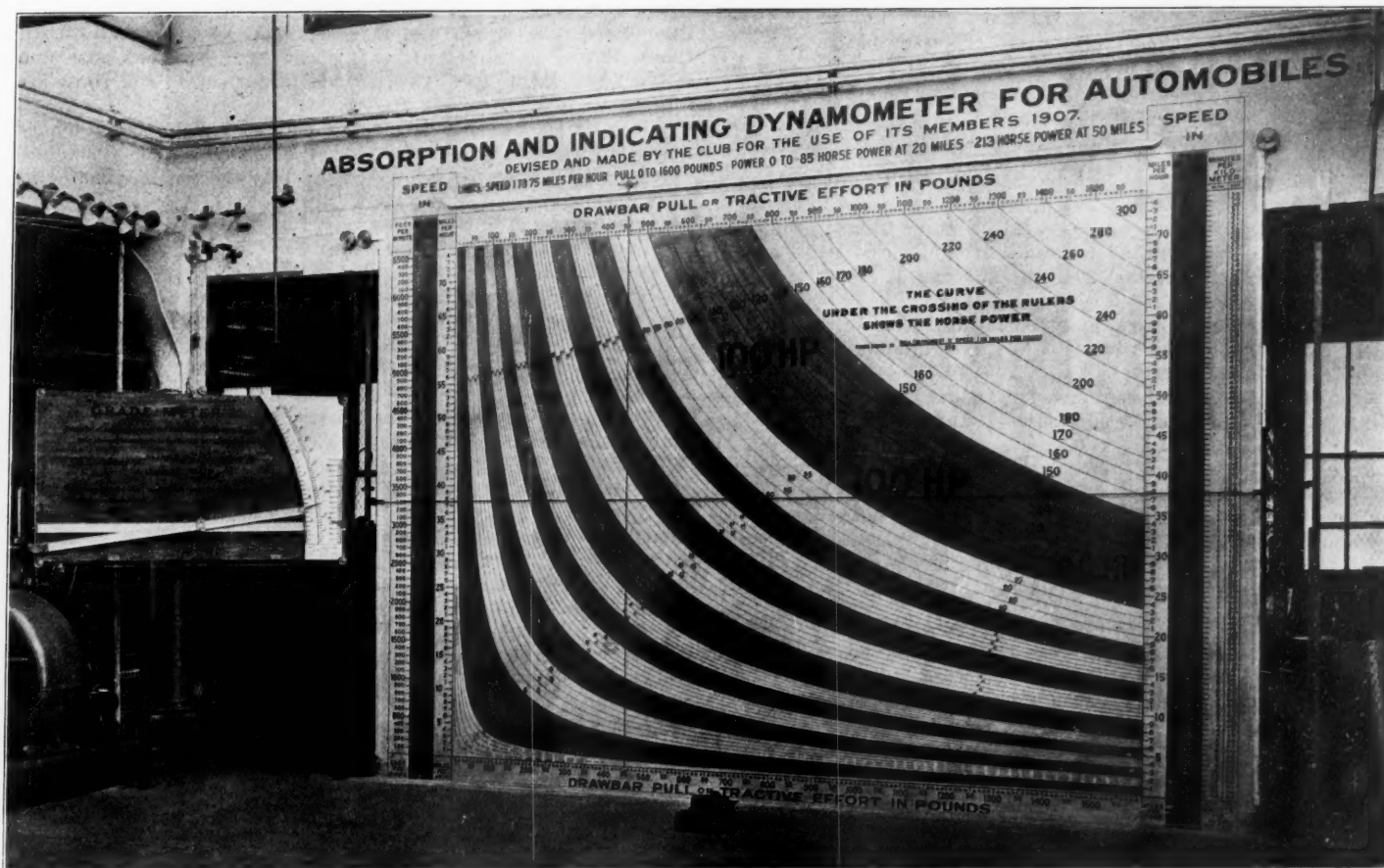
The following abstracts cover the principal penalty laws in a group of southern states:

##### ALABAMA.

Free time under car service rules, 72 hours on fertilizers, hay, coal, coke, brick, lumber in box cars, bulk meat, potatoes, grain and grain products, cotton seed, cotton seed meal and cotton seed hulls, and 48 hours on other freight, Sundays, holidays and bad weather days not counted.

The 1907 Legislature passed 52 bills inflicting severe penalties, the effect of which was to decrease earnings, to increase expenses by inflicting penalties, forfeits, increased taxes, etc.

The demurrage laws of Alabama as enacted by the 1907 Legislature differ from the requirements of any other state, in that the maximum charge for car service is fixed at \$10 per car. No other



Wall Chart; Automobile Dynamometer.

in either of the popular ways of stating it: Miles per hour; minutes per mile, kilometers, etc., by means of the several different scales provided.

All of the measuring apparatus is made reversible so that when running backward the performance of the car may be measured.

As a secondary apparatus, a grade meter is provided, operated by the pendulum indicator of the dynamometer. To use the grade meter the clamp is set upon the sliding scale at the point representing the weight of the car. The moving lever then assumes at each moment the angle of inclination of the grade the car would climb (if there were no wind resistance, slipping, etc.) with the effort that the car is then making.

To observe an automobile coasting down hill, either forward or backward, it is necessary merely to start the electric motor on the shaft carrying the two large drums upon which the driving wheels of the automobile rest. The brakes may then be tested and the wheels or gears or engine may be run free (not run by the power of the automobile) and the relative friction loss in the principle of the automobile may be ascertained.

The consumption of petroleum for fuel in Russia has been suddenly checked, due largely, and perhaps chiefly, to higher prices. During the first nine months of 1907 the six railroads which have been the chief users of petroleum consumed but 142,500,000 gallons in 1907, against 261,500,000 in the corresponding nine months of 1906, a decrease of no less than 45 per cent. Meanwhile the pro-

state imposes a maximum charge for car service, and under the state laws, when a receiver of freight has detained a car long enough to accumulate a demurrage charge of \$10 he is at no expense for any additional detention of the car.

Among the penalties fixed by the 1907 Legislature are the following:

Penalty of \$500 for each failure to give receipt for application for cars to be loaded.

Penalty of \$1 per car per day, maximum \$10 per car, for failure to furnish cars for loading within the specified periods.

Penalty, carloads \$1 per car per day, less than carloads 1 cent per 100 lbs. per day, for failure to receive freight and issue bills of lading therefor.

Penalty on carloads \$1 per car per day, and on less than carloads 1 cent per 100 lbs. per day, maximum penalty \$10, for failure to transport shipments at the rate of 50 miles per day of 24 hours, computing from 7 a.m. of the day following receipt of shipment.

Penalty on carloads \$1 per car per day, less than carloads 1 cent per 100 lbs. per day, maximum penalty \$10, for failure to give consignees notice of arrival within 24 hours after arrival of the shipment.

Penalty of \$1 per car per day for failure to deliver freight or to place cars for unloading within 24 hours after arrival, computing from 7 a.m. of the day following arrival.

Carriers are not permitted to release cars by unloading carload freight for storage into their own warehouses or into public or

private warehouses until \$5 demurrage charges have accumulated. This practically means, until the carrier has suffered 10 days delay.

Penalty of 115 per cent. to 400 per cent. of the amount of the claim for failure to pay loss and damage claims within 60 days, the penalties varying with the amount of the claim.

Penalty of \$1 per day, maximum penalty \$100, for failure to pay overcharge claims within 60 days.

Penalty for entering suit through federal court, cancelation of license to do business through the state of Alabama.

Penalty for reissuance of license, one-tenth of 1 per cent. of corporation's capital stock.

Franchise tax, foreign corporations with actual capital of over \$1,000 employed within the state of Alabama to pay annual franchise tax of 25 per cent. of the first \$100, 5 per cent. on the amount in excess of \$100 up to and including \$1,000, and one-tenth of 1 per cent. on the amount over \$1,000, this applying only to that part of the capital employed in the state of Alabama.

Penalty of \$100 per day for each day's failure to make annual reports of State Railroad Commission within specified time.

Penalty of \$100 for each day's failure to file with the State Railroad Commission abstracts or lists of vouchers or receipts within specified time.

An act prohibiting carriers from entering into any bill of lading contract, stipulation, receipt, rule or regulation in any way limiting their liability for loss of or damage to property received for transportation, thereby requiring carriers to become responsible for acts of God and the public enemy.

#### FLORIDA.

The free time under car service rules is from 72 to 96 hours, according to the commodity. The Florida commission indulges in a system of fines when the railroads fail to move freight promptly; for diversion of business, and for other irregularities which might occur in the operation of the line through fault of agent, trainmen or workmen.

Penalty of \$1 per car per day for failure to deliver freight or to place car for unloading within 72 hours, computing from 10 a.m. of the date following arrival.

Penalty of \$2 per car per day for failure to furnish cars for loading within two days on perishables and four days on other freight.

Penalty on carloads \$2 per car per day, and on less than carloads 1 cent per 100 lbs. per day for failure to transport freight 56 miles within two days, and each additional 50 miles within one day 24 hours additional time allowed for transfer to connecting line.

Penalty of 25 per cent. of the amount of claim for failure to settle claims within reasonable time.

#### GEORGIA.

Under car service rules the free time in Georgia is generally 48 hours. The penalty rules of Georgia were largely imposed by the State Railroad Commission in the year 1906, and they stand to-day as follows:

Penalty of \$1 per car per day on carloads and 1 cent per 100 lbs. per day for less than carloads for failure to give notice of arrival within 24 hours.

Penalty of \$1 per car per day for failure to furnish cars for loading within four days, Sundays and legal holidays excepted.

Penalty of \$1 per car per day on carloads and 1 cent per 100 lbs. per day on less than carloads for failure to forward freight at the rate of 50 miles per day, computing from 7 a.m. of the day following receipt of shipment.

Penalty on carloads \$1 per car per day, less than carloads 1 cent per 100 lbs. per day, for failure to deliver freight or to place cars for unloading within 48 hours from 7 a.m. following day of arrival.

Penalty of \$1 per car per day for failure to deliver cars to switch connection within 24 hours after notice from consignee.

Penalty of \$1 per car per day for failure to receive and place switch cars within 24 hours.

Forfeit of value of goods with interest at 10 per cent., penalty not to exceed actual damage plus 25 per cent. for failure to observe shipper's routing.

Penalty of double the amount of overcharge for failure to pay overcharge claim within 30 days.

Penalty of full damage to be paid by initial line regardless of place of damage for failure to trace freight and advise applicant within 30 days of the cause and place of delay or damage.

Penalty of \$50 for failure to pay loss or damage claim intrastate within 60 days and interstate within 90 days.

#### NORTH CAROLINA.

The car service rules of the North Carolina commission allow 72 hours free time on fertilizers in sacks or in bulk, and on brick, cotton seed, cotton seed hulls, coal, coke, fertilizer materials, grain and lime and tanbark in bulk, and dressed lumber in box cars, and 48 hours free time on other freight, Sundays, holidays and bad weather days not included.

The following forfeit and penalty requirements are a result of legislative enactment:

Penalty of \$50 for failure to forward freight by route designated by shipper.

Penalty on carloads \$15 first day and \$20 each succeeding day, and on less than carloads \$10 first day and \$1 each succeeding day for failure to transport and deliver freight within the time specified within the statute, this penalty being in addition to actual damages, if any, sustained by the claimant.

Penalty of \$50 for failure to deliver freight upon tender of legal freight charges.

Penalty of \$50 for failure to pay loss and damage claims intrastate within 60 days and interstate within 90 days.

Penalty of \$5 per car per day for failure to furnish cars for loading within four days from 7 a.m. of the day following such application.

The 1907 Legislature of North Carolina passed a bill limiting hours of trainmen, enginemen and telegraphers to conform with the Federal law which becomes effective March 4, 1908.

#### SOUTH CAROLINA.

Demurrage rules of the South Carolina Commission allow 48 hours free time in the case of personal notice, and 72 hours free time in the case of mail notice, except that 24 hours additional free times allowed on grain and grain products, cotton seed, coal, lumber in box cars, brick, etc. The various penalty laws and rules are as follows:

Penalty of \$50 for failure to deliver freight upon tender of lawful freight charges.

Penalty of \$500 for failure to pay loss and damage claims intrastate within 40 days, interstate within 90 days.

Penalty of \$1 per car per day for failure to furnish cars for loading of dead freight within four days, and of perishable freight within three days.

Penalty of \$1 per car for failure to deliver freight or to place cars for unloading within 48 hours from noon of the day following.

Penalty of \$1 per car for failure to issue bill of lading and forward dead freight within 48 hours, and perishable freight within 24 hours.

Penalty of \$5 for each and every failure to bulletin passenger trains in accordance with the legislature's requirements.

Forfeit of five times the value of property so confiscated for confiscation by carrier of fuel or other property for its own use.

Penalty of \$25 for failure to advise consignee of live stock delayed more than three hours of the cause and extent of the delay and expected time of delivery.

Fine of \$5,000 for each and every failure to provide union and other depots as required by State Railroad Commission.

Penalty of \$5 per shipment per day (maximum value of goods and transportation charges) for failure to transport freight within the time specified within the state statute.

Penalty of \$1 per day for failure to furnish consignee within 10 days information as to the cause of delay to delayed freight.

#### VIRGINIA.

Storage, demurrage and car service rules, including penalties, are made by the State Corporation Commission, and the current rules have been in effect since Aug. 15, 1903. The Commission has now under consideration changes that will not in any way lessen the burdens imposed upon the carriers by the existing rules. The existing rules provide, among other things, as follows:

Forfeit of \$1 per car for failure to furnish car for loading within four days.

Forfeit of \$1 per car per day on carloads, and 1 cent per 100 lbs. per day on less than carloads for failure to transport freight at rate of not less than 50 miles per day of 24 hours, computing from 7 a.m. of the day following receipt of a shipment.

Forfeit of \$1 per car per day on carloads and 1 cent per 100 lbs. per day on less than carloads for failure to give consignee notice of arrival of freight within 24 hours.

Forfeit of \$1 per car per day for failure to place cars for unloading within 24 hours, computing from 7 a.m. of the day following arrival.

Free time on freight to be trans-shipped by water; 10 days on fertilizers, hay, coal, coke, brick and lumber in box cars, meat, potatoes, grain and grain products, cotton seed and cotton seed hulls in bulk 72 hours, and on other freight 48 hours, Sundays, holidays or bad weather days not included, and free time allowed.

The estimates of the Prussian State Railroads for additions to rolling stock to be delivered before Oct. 1 next amount to the tidy sum of \$31,423,140, to be expended for 710 locomotives at an average cost of \$16,425 each, 2,105 passenger and baggage cars at \$4,390 each, and 14,160 freight cars at \$757 each—the latter nearly all four-wheeled cars of less than half the average capacity of our cars. It is expected that about 16,000 more cars will be needed between October and April.

### The Railroad System of Newfoundland.

Newfoundland has a unique position in the railroad world. It has a narrow gage railroad system 635 miles long, with steamer connections to different parts of the island and to the peninsula of Labrador, making a total mileage of steamer lines of 3,364 miles. The railroad lines and the steamer lines are all under the same management. They are the property of the Reid Newfoundland

special steamer services. Express trains which are scheduled to cross the island in 28 hours are run three times a week. The Reid Newfoundland Company's steamship "Bruce," a 17-knot flyer, plies nightly across the 90 miles of Cabot strait, which lies between Cape Breton island and the southwestern extremity of Newfoundland. This steamship connects with the Newfoundland system at Port aux Basques and with the Intercolonial Railway at North Sydney. On the other days of the week local railroad service is operated across the island. Other trains twice a day serve the more populous centers within 100 miles of St. Johns.

The railroad is equipped with 25 locomotives, 38 passenger cars and 364 freight cars. It has two rotary snow plows and other snow fighting equipment. A large granite station at St. Johns built at a cost of \$100,000, holds the general offices of the company. The rolling stock is of modern construction and of good design. The locomotives were especially designed and built by the Baldwin Locomotive Works; the passenger cars were built by the Dayton Manufacturing Company, of Dayton, Ohio; Rhodes, Curry & Company, of Amherst, N. S., and by the company's own shops, which turn out cars equal to the best bought abroad. The best class of cars are mahogany finished inside and out. Through trains have sleeping, dining, colonist, day and baggage coaches. The roadbed is well built and has been considerably improved during the last ten years. The bridges are built on masonry abutments with steel girders.

The passenger traffic of the system is large and steadily growing. The colony of Newfoundland has 250,000 people and the movement of local passengers is one of the main sources of traffic. At certain seasons of the year a large number of the people of Newfoundland find employment in the steel works and coal mines on Cape Breton island, and this makes a considerable passenger movement. There is also a steadily growing tourist travel from Great Britain, Europe and the American continent.

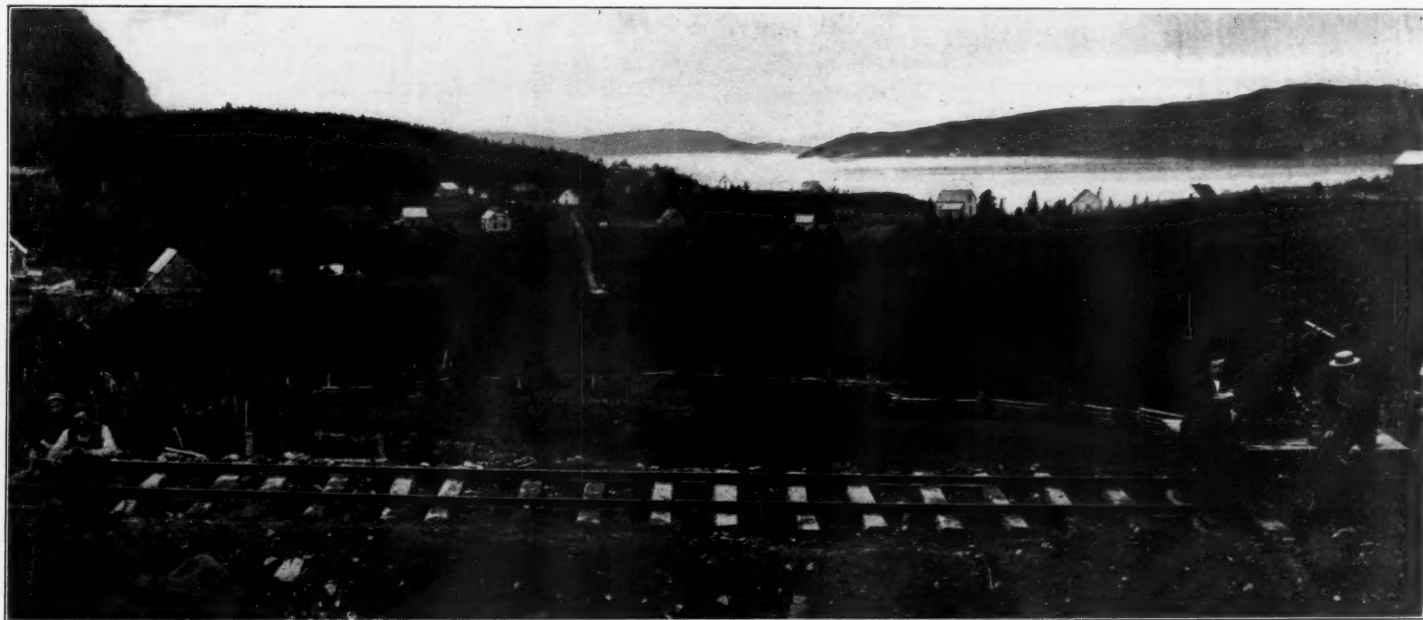
The freight traffic is made up of lumber and the commodities required by a community scattered over 6,000 miles of coast line and of itself producing nothing except its catches of cod, seal, herring, lobster and whale. All other necessities of existence, such as food and clothing, come from St. Johns. A large increase of the freight business is assured through the recent establishment by two large corporations financed in London, the Harmsworth and the Albert Read companies, each capitalized at \$5,000,000, of pulp mills on the Exploits river, inland from the coast. These two enterprises promise to become important factors in the industrial development of the colony. Near St. Johns are iron mines and in the northern part of the island copper mines which furnish traffic. Agricultural settlements also are springing up at various points along



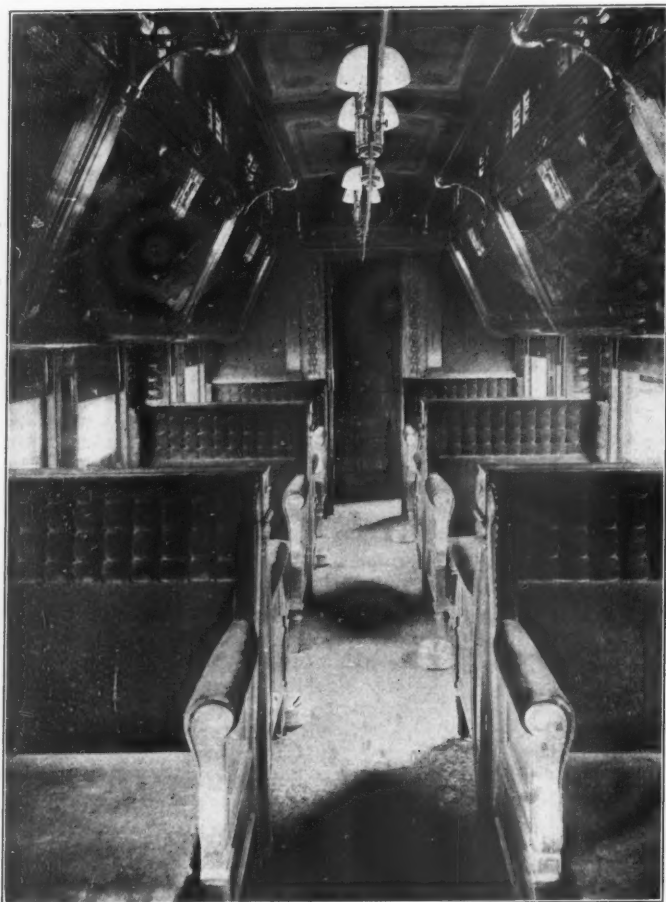
Newfoundland and Its Railroad System.

Company, whose President, Sir Robert Reid, was recently knighted for his conspicuous services in the development of Newfoundland. The same company owns at St. Johns, the capital of the island and the eastern terminus of the railroad, a large dry dock, an electric light plant and the local street railway.

The railroad runs from St. Johns on the east coast of Newfoundland westward across the island to Port aux Basques, connecting either directly or by branches with most of the large bays with which Newfoundland is surrounded, which are served by



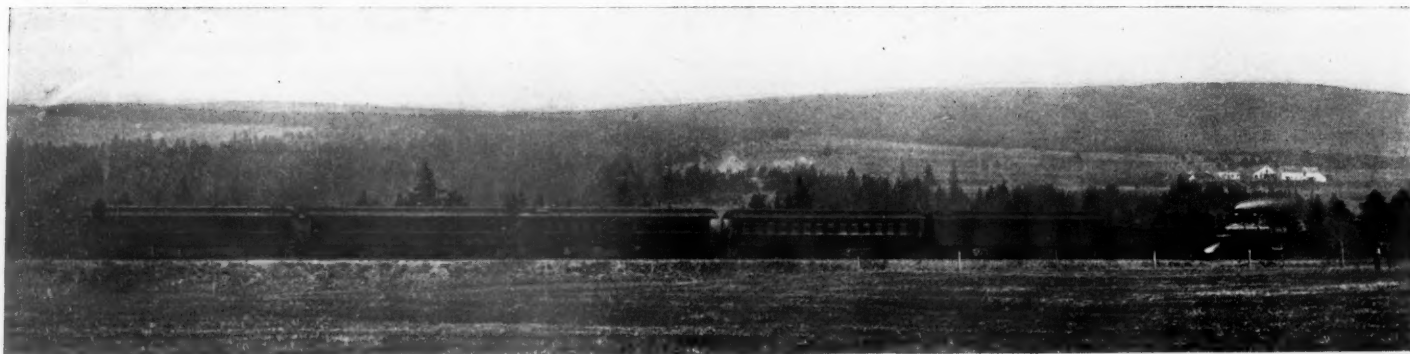
Bay of Islands, Newfoundland.



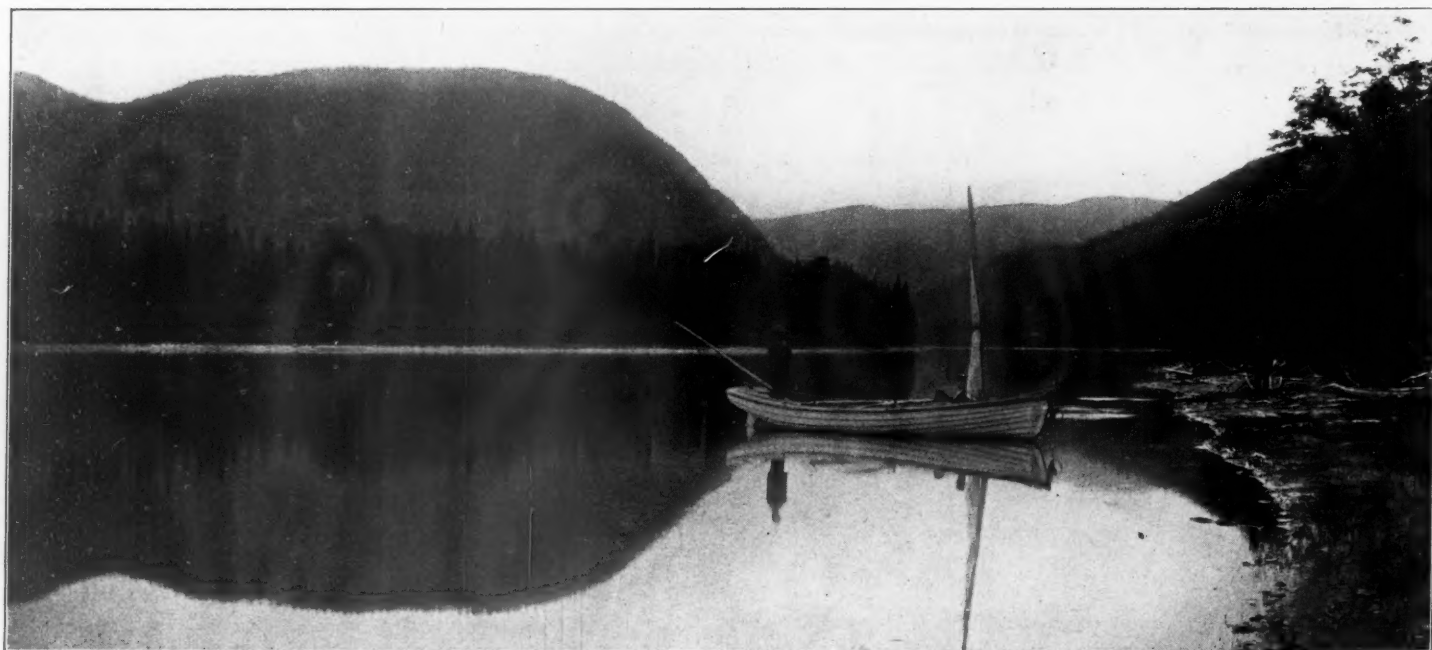
Inside View of Narrow Gauge Sleeper.



Caribou Crossing the Railroad.



Standard Passenger Train; Reid Newfoundland Company.

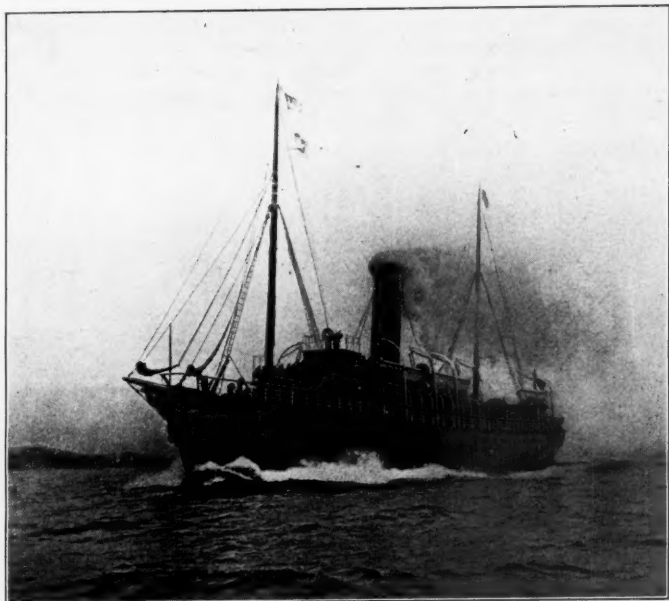


Upper Reaches of the Humber River in Newfoundland.

the railroad and large additions of traffic are expected from this source.

From Port aux Basques the steamer "Glencoe" plies eastwardly along the south coast to Placentia bay, 371 miles, where connection is made with a branch of the railroad connecting directly with St. Johns. From the railroad at Bay of Islands station, on the west coast, the steamer "Home" plies north to Battle Harbor, Labrador, on the straits of Belle Isle, 379 miles. The railroad connects with Notre Dame bay on the north coast by a branch from Notre Dame Junction to Lewisport, from which the steamer "Clyde" furnishes a weekly service around the bay. This trip is 362 miles long. From Port Blandford the steamer "Dundee" performs a similar service for Bonavista bay; a 148-mile trip. Trinity bay and the west side of Conception bay as far south as Carbonear, are served by the steamer "Ethie," which connects with the railroad at Clarenville and Carbonear. This is 152 miles. A branch of the railroad touches every important place on the rest of Conception bay. These last three bays are on the east coast. Placentia bay, on the southwest, is served by the steamer "Argyle." This route is 294 miles long. During the summer there is fortnightly service from St. Johns by the steamer "Virginia Lake" to Labrador, which is 1,021 miles away.

The operations of the Reid Newfoundland Company are large and varied. The steamship "Bruce," the connecting link for through traffic between Newfoundland and Cape Breton island, was built on the Clyde for this particular service at a cost of \$250,000. A photograph of this steamer is shown. The seven other steamers of the company's fleet represent an outlay of \$1,000,000 more. The company is adding new railroad equipment at the rate of \$250,000 a year. Owing to the increasing demands of traffic it is probable that



Reid Newfoundland Company's Steamship Bruce.

a daily train and steamship express service will be begun in the near future. Passenger and freight tariffs are made on a mileage basis, the distance by rail or by boat being counted as part of the one journey. Through tickets are on sale between all important points in Canada and the United States to Newfoundland points and baggage can be checked through on these tickets. Joint traffic arrangements for freight have been made with Canadian and American railroads and there is a steadily growing interchange business. The company has a monopoly of the public service facilities of the city of St. Johns, including the electric light system and the street railway, whose earnings in the calendar year 1907 were \$31,948, an average of about \$87 a day. During the year it carried 638,967 passengers. An electric power house has been built at Petty harbor, nine miles from the city, which furnishes power for both these operations and for various other industrial enterprises. The Colonial dry dock owned by the company is situated at the western end of the harbor and is capable of taking up the largest ocean going steamships. Here steamers can be found under repair the year round, for St. Johns is a noted haven for shipping in distress on the western ocean. The machine shops are near the dry dock and are used for both car and ship repairs. As an adjunct to the dry dock the company owns a powerful wrecking tug equipped for marine salvage work.

A large part of the company's expectations for future increases in traffic are based on the wonderful natural resources of the island as a tourist and sporting resort. It has beautiful scenery, bracing climate and a wide range of hunting and fishing opportunities. There is sport at Newfoundland at all seasons of the year. Of large game there are bears, wolves, caribou, otter, marten and beaver. Other game, migratory and indigenous, includes the hare, rabbit, ptarmigan, spruce partridge, Canada goose, ducks of many varieties,

snipe and plover. There is fine trout and salmon fishing. Most of the interior of the island is untraveled. Only a few sportsmen have crossed its broad barrens and climbed its rugged mountains.

J. C. Millais, the English naturalist, son of the famous painter, has recently published an elaborate volume describing his journey in the untrodden interior of Newfoundland in which the joys of caribou hunting are enthusiastically described. This sport can be obtained more cheaply and with less discomfort than deer hunting can in other parts of the world. From New York and New England it is only a three days' journey to the best hunting grounds in the interior of Newfoundland. Guides and helpers can be obtained at rates much below those charged elsewhere, the only fee imposed by the colonial government on sport of any kind is one of \$50 on visiting caribou hunters. Payment of this fee entitles one to shoot three stags. Every other form of sport with rod and gun is free. One of the photographs shows caribou near the railroad line. Moose have recently been introduced and are thriving well, but are still protected. The number and variety of wild fowl is very great.

For the summer tourist the air is bracing, the climate salubrious and the surroundings stimulating. A variety may be given to a visit to Newfoundland by cruising on the different steamers, visiting the various bays about the island and observing the fisher folk engaged in the operations which yield them subsistence. The cod and other fishing has many picturesque incidents, though tragedy often accompanies it, for the wind and sea are at their strongest in this region. One of the most remarkable attractions is the daily procession of majestic icebergs drifting south along the Newfoundland coast from the arctic region. These present the most striking pictures. The Labrador trip is also a remarkable one. The region compares with Norway, and besides the wonderful beauty of its scenery, offers fine sport for rod or rifle.

#### Signals and Automatic Train Stops in the Hudson & Manhattan Tunnel.

The signaling of the recently opened up-town tunnel of the Hudson & Manhattan Railroad under the Hudson river consists of automatic block signals and automatic train stops, covering the double-track line between Nineteenth street, New York, and Hoboken, N. J. Between Hoboken and Greenwich avenue, New York, the river section of the tunnels, signals are placed, on the average, 367 ft. apart, making 14 blocks to the mile. The minimum distance where speed is low is 115 ft., and the maximum is 1,620 ft. On steam railroads, block signal sections average 2,640 ft., or two to the mile; on the express tracks of the Interborough Rapid Transit Subway the distance is 800 ft., or nearly seven to the mile.

The signals give three indications: Proceed, indicated by a green light; proceed with caution, yellow light; stop, red light. There is an automatic stop at each stop signal. This device has two movable short arms or trips, one placed alongside each rail. When the signal is in the stop position, these arms are raised to engage with the trigger of a valve in the air-brake pipe of the train, releasing the air and setting the brakes. Each car is equipped with two of these valves, one at each end and on opposite sides of the car. When the signal moves again to the proceed position, the electric motor lowers the stop arms, permitting the train to pass without setting the brakes; the arms return to stop position by gravity after the train has entered the block. This device is used on the Boston Elevated and on the Interborough Rapid Transit subway express tracks, but on these lines only one arm is used.

The arrangement of the block sections is unusual and so designed to provide more train capacity without loss in safety. In steam railroad signaling, with few exceptions, the block sections end at the home signals, no clear space being provided at each signal in case a train should overrun it. In the Interborough Rapid Transit subway the block sections overlap each other for half their length. In the Hudson & Manhattan tunnel, one block section is the length of three overlaps. Thus each train is protected by three stop signals, four caution signals and two automatic train stops. The length of overlap is equal to the distance in which a train moving at maximum speed can be stopped, plus a 33 1/3 per cent. safety margin.

Both rails of each track are used for the train propulsion current and also for the signal current. This constitutes broken rail protection.

There are seven interlocking plants: One, the largest, at the Hoboken terminal; two at caisson No. 1; two at caisson No. 2; one at Greenwich avenue, and one at Nineteenth street. The Taylor all-electric system is used. The signals are the same type as used in the block system. Illuminated track indicators are placed in front of each interlocking machine for the information of the operator.

In all, 90 home signals, 82 distant signals, 10 dwarf signals, 13 switches and 85 automatic train stops are used.

The signal system was furnished by the General Railway Signal Co., Rochester, N. Y., and the automatic stops by the Kinsman Block System Co., New York.

### The Ocean Carrier.

BY J. RUSSELL SMITH, PH.D.

#### IX.

##### *The Organization of Ocean Carrying.*

We naturally think of the traffic of the land as being carried on by this or that railroad, and we think of the railroad as a carrying unit. Further than this the wide prevalence of the steamer line tends to produce in the minds of those not directly interested, the idea that upon the ocean also the world's traffic is moved by the steamship line—as it is upon the land by the railroad line. Such an idea of marine uniformity is far from the facts, for the ocean traffic differs profoundly from that upon the land in that it has three distinct types of service. These are the common carriers, the merchant or private carriers and the charter carriers, the host of single independent ships that are for hire to any bidder.

The sea has a freedom and a cheapness unknown to the large scale land carriers and it profoundly affects the organization of the ocean carrying. The most pronounced and far-reaching difference between ocean transportation and land transportation arises from the fact that the ocean is a highway without the efforts of man, and the navigator has but to provide his vehicle. By land roads must be made even for a pack train. For carrying upon the ocean the completion of the ship is all that is necessary, and if she be a siler the winds of Providence will drive her into all seas and around the world. This fundamental difference in the ocean trade produces many peculiarities unknown upon the land. Because of the smaller capital that is required upon the ocean, we find relatively more individuals and groups of individuals acting independently than we do in the railroad traffic of the land. The single vessel operated as a unit has as much independence as the great line of steamers, and in some respects more independence. Both are alike free to pass over the high seas, to take advantage of the government surveys thereupon, and to enter the harbors that connect with the land, for every port welcomes the greatest possible multitude of ships.

In closer examination of this traffic the first to be considered is the single vessel that is managed as an independent unit. Such vessels do not attract much attention. They come and go unnoticed in news columns of the public press unless perchance they meet with accident, and the reading and traveling layman does not often have his attention called to them. They do not carry his mail, his baggage or his person. These choice and exacting services are rendered by the aristocrats of the deep, the great lines, whose names and performances and owning companies are known by tens of thousands of people scattered over all parts of the reading world. The advertisements of these ships, photographs included, reach the inland hamlets of the five continents, and their movements are heralded as news by numerous journals. They are very important. They carry passengers, mail and much freight with speed, regularity and high cost, and for that reason they do not and cannot do all the ocean's work. The single ship gives a cheaper service and there is therefore a large part of the world's ocean carrying left for it to do, and it is done with little comment or public notice.

If every port in the world had a large trade, made up of a wide variety of articles shipped in fairly even quantities throughout the year, there would probably be no vessels operated singly. With such an even and dependable commerce ships could be organized into lines which would handle the traffic in regularly recurring shiploads. But those conditions of evenness and variety and dependableness do not exist. The nearest approach is in the great commercial ports such as New York, Liverpool, London, Hamburg. In these ports the per cent. of traffic in the line vessels is increasing and that in independent vessels is decreasing. One cannot generalize on world commerce from the world's great ports, for they are few in number and the small ones are very numerous.

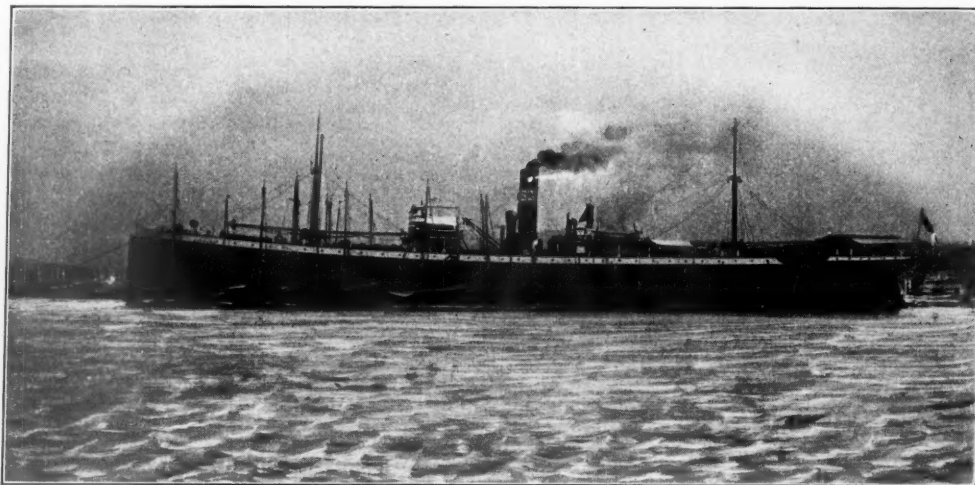
During the decades that have made up the railroad era many new lands have been opened to commerce, new products introduced, new parts established. In the vast majority of the many hundred of ports upon the world ocean, the bulk of the commerce is limited to a very small variety of articles, often a single article, and that again is often shipped during only part of the year. It is most likely to be a raw product, cheap, and heavy, which must be carried at as low a rate as possible. This then is not work that can be done by the carefully organized line of vessels. This simpler, unorganized and cheaper service falls to the independent

vessel that is for hire, and works as a unit wherever there is work to be done. These vessels are built and owned for just this work. The contract that the lessor and lessee sign when the vessel is hired is called a charter, and the ship is spoken of as being chartered, but if regularly for hire she is commonly called a "tramp." Such vessels carry a large share of the world's trade and are utilized for any freight that may go in shipload lots. For the carrying of raw materials, and cheap, heavy or bulky goods, the regularity and promptness of the line vessel are not often required. Cheapness is the prime factor. This is true of a long list of commodities lying at the very foundation of modern industry.

As the prime requisite of the charter traffic is cheapness with safety, the combined efforts of the marine architect and the ship-owner have been toward economy in cost of operation, while the managers of lines are often striving for regularity and speed regardless of cost. The economics of the tramp steamer fall under three classes:

1. Construction.
2. Navigation.
3. Management.

1. The tramp steamer is built upon a sort of general average model to fit her for as many kinds of service as possible and to go into all oceans and ports. The first object of the designer is to fit her for holding much cargo rather than making high speed. These two diverse objects in design give a great difference in the resulting shape of the ship. The sharp bow and curved ribs of the fast line steamer are replaced in the tramp by a blunt bow, a flat bottom and straight sides, producing in her model a strong resemblance to the cubical form of a section of a squared log. The ship builders' term, "block coefficient of fineness," shows the per cent. that the ship's displacement is of the content of a circumscribing parallelopipedon of the following dimensions: length of ship on the load line, draft



Satsuma; Barber & Co., Typical of the Charter Fleet.

and breadth. This coefficient for an ocean greyhound is about sixty-two per cent.; for a nine-knot tramp steamer about eighty per cent. The keel of romance is replaced by a steel bottom as flat as the floor of a warehouse. The keel, as a center of construction, is inside rather than outside the line of the hull, enabling the ship to store freight in every foot of her depth. To prevent the rolling of the vessel, this freighter has bilge keels—fin-like strips of metal riveted to her hull near the blunt angles between the bottom and the sides. With her flat bottom she can cross bars to enter the shallow harbors of any ocean and engage in almost any trade.

2. The economics of navigation group themselves around the central question of speed. It is a fact in mechanical engineering that high speed is attained at much greater expenditure of power per unit than that required to traverse the same distance at low speed. In automobile tests a four-horse-power car has made fifteen miles per hour, but seventy horse-power was required for sixty miles per hour. The increase in fuel required is in a similarly high ratio, sometimes approaching in steamships the square of increase in knots per hour. The fast steamer, in addition to form that does not make resistance in passing through the water, must have enormous engines and heavy coal consumption, and larger crew to handle it. These factors mean more expensive construction, less space for freight because of engine room, coal storage and crew quarters; more expensive operation because of greater wear of machinery, and cost of coal and crew. The advantage side of the account arises from the fact that there are more voyages in a year and consequent greater carrying power and because of the speed higher freight rates may be charged. But at twenty, twenty-two or twenty-four knots per hour the cost of this service is more than traffic in raw materials can stand.

At the other extreme of the mechanical question is the fact

that low speeds cost a surprisingly small sum. A steamer could make four knots per hour with modern engines at a very small percentage of the cost required for twenty knots, but she would make such a small number of voyages per year and command such low freights that it, like the high speeds, would not be profitable for freight carrying. For freight carrying there is a point of equilibrium in speed above which additional speed costs more in outlay than it adds in income, and below which a lessened speed costs more in loss of earning power than it saves in operating expenses. This point of equilibrium rises with every improvement in engine construction. At present the usual speed for tramp steamers is about nine to ten knots per hour, and it may be confidently expected to increase, some of the newest steamers being already somewhat above it.

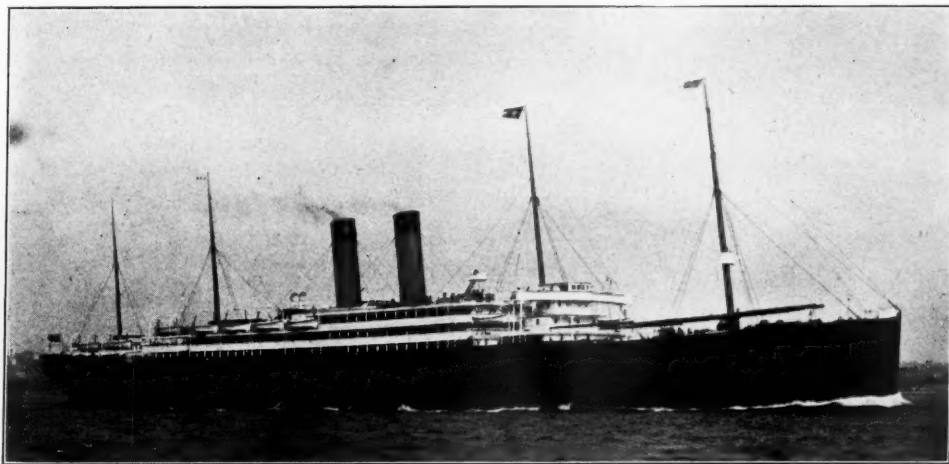
These comparisons between the chartered vessels and the liner may be brought out more clearly by the examination of the actual facts of operation of typical vessels of each class.

The "Baron Eldon" is a British tramp steamer, built at Sunderland (1899) for general work. The gross tonnage is 3,705 net tonnage, 2,385 and the crew, 29 men, all told. Her dead weight capacity is 6,100 tons and she has actually carried as cargo 5,360 tons of coal on one voyage and on another 5,550 tons of rice. Her coal consumption at nine knots per hour is 22 tons per day. The "Kaiser Wilhelm II" and the "Cedric" are two modern ocean giants, and built for the North Atlantic line traffic. The "Cedric" is not a racer, however, and has a displacement of 37,870 tons, will carry 18,400 tons of freight, 3,000 passengers, a crew of 350 and has a coal consumption of 260 tons per day at 17 knots per hour. The "Kaiser Wilhelm II" built to break all records, has a displacement of 26,000 tons, will carry less than 1,000 tons of freight, 1,888 passengers, and has a crew of 600, with a coal consumption of 750 tons per day at 24 knots per hour. She could beat the "Cedric" by

As there is no effort to hold patrons and develop a clientele, there is little expensive advertising done, and the simplicity of the cargoes requires a minimum of office force.

The business of managing this charter traffic is one of the most characteristic developments of the world's commerce of the present era, the epoch of the ocean cable. Several thousands of ships are scattered over the ocean of the commercial world, engaged in the traffic that is supplied by hundreds of ports in all climes and all continents, from Greenland to New Zealand. Every day scores or even hundreds of these independent vessels are seeking freight to carry. It is a complicated world puzzle to bring together the ships and the freight so that the one may be most profitably employed, and the other most economically carried. The work is done by the ship brokers and steamship agents who receive their pay in the form of a commission or brokerage, a percentage on the transaction. In all shipowning countries these firms have their headquarters, and each one has agents and "correspondents" in many other countries, so that among them all they make a complicated web that reaches to all cities of commercial importance. The whole is so bound together by telegraph and cable, that, like a spider's web, if touched by anything of importance at any point, the whole structure vibrates with the news. The departure of a steamer loaded with sugar from a small port in Java or ore from Chile, is reported by telegraph in Europe and America. There is practically a complete record of all vessel movements published daily by Lloyds, the great British Association of Underwriters. The men engaged in world commerce have, through their world telegraph, a world community of information.

The method of securing cargoes for ships, and ships for cargoes, is best described by the relation of some common incidents of every day occurrence. A Liverpool shipowner had a steamer in the Mediterranean loaded with jute, which she was carrying from Calcutta to Dundee. The owner desired another cargo for the steamer at the end of the voyage. Knowing there was nothing in Dundee he wrote to his agent in Newcastle, and himself made inquiries among the shippers of Liverpool. The Newcastle man suggested a cargo of coal to Hamburg, but this the owner declined, and sought the aid of his correspondents in Dumbarton, but the iron trade of Dumbarton was not promising. Meanwhile the days were passing, the vessel had reached Dundee and there was nothing provided for her. The Liverpool man was himself the correspondent of a London firm of ship brokers, who telegraphed him at this juncture that they had offers of a shipment of German coke to go from Rotterdam to Santa Rosalie, lower California, and of another of Cardiff coal for Buenos Ayres. The first the shipowner declined, as being only suitable for a sailing vessel, and because of news from across the Atlantic he allowed the second to go to a steamer then lying at Antwerp. Three days before this he had cabled



Baltic; White Star Line, 23,876 Tons. Best Type of Liner, Less Than Express Speed.

about two days in a voyage from New York to Liverpool, but to make this gain her crew is nearly doubled and the daily coal consumption nearly trebled. The coal consumed by the "Kaiser Wilhelm II" in one day would run the "Baron Eldon" with her large amount of freight for thirty days, and carry her from New York to Liverpool and back to New Orleans. In this comparison the fact should not be overlooked that the "Kaiser Wilhelm II" carries 1,888 passengers. The "Baron Eldon" carries none, but her gross tonnage of 3,705 tons is a disproportionately large fraction of the Kaiser's 19,500.

3. The economies of management are possible because of the lack of dependence upon other ships and because the work is always of a temporary nature. The tramp has no schedule, and is free from the exactions of any particular round of engagements or the disadvantages of any particular route. She undergoes no unnecessary dallying at ports waiting for sailing day. The coming of passengers, the arrival of mails, long time contracts to carry certain freight, none of these handicaps of the liner affect her movements. As soon as her special cargo is loaded she is dispatched without loss of time. No further time is lost in making unprofitable calls at intermediate ports, and as soon as her destination is reached she is free to unload and seek further employment. No announced schedule requires her to be run, half empty, over a certain route or to lie in port awaiting freight as advertised. She has the freedom of the seas to seek freight in any port in any continent, to take advantage of any local conditions, any single shipment, that may appear to her advantage. If a bad harvest in America cuts off the grain export, the tramp that has been working in the north Atlantic may seek freights at the mouth of the Danube or South Russia or in the Indian Ocean or in the East Indies; wherever freight is offering, there may she go.

to his New York correspondent a description of the steamer, and offering her services to carry grain to the United Kingdom at a certain rate and saying that she could load after a certain date or between certain dates. As New York freight was dull, the firm in that city telegraphed their Boston and Philadelphia agencies. At the same time a Chicago grain exporter decided to export 150,000 bushels of corn, and telegraphed to his agents in New York and Philadelphia to secure offers of transportation. In the shipping exchanges of those cities the representatives of the Chicago exporter and the Liverpool shipowner bargained face to face. Offers were, however, made at the same rate by the New York representative of the owner of a ship then off Rio Janeiro with a cargo of Chilean nitrate bound for New York, and also by a Philadelphia broker who sought future employment for a vessel then in the Red Sea with a cargo of Java sugar for Philadelphia. The Liverpool owner was informed of this competition, and still having nothing for his steamer he cabled that he would charter his ship for three pence (6 cents) less per ton than he had offered, or for the same rate he would take freight to continental ports as far as Copenhagen. He added to his cablegram the word "range," which means in cable code that he would send the ship to the Delaware Bay with the understanding that she might be ordered to New York, Philadelphia, Baltimore or Norfolk to load. This offer secured the freight for the representatives of the sugar ship and the nitrate ship having more time at their disposal preferred to take chances rather than cut rates. The steamer, which, pending negotiations, was still lying at Dundee, proceeded to Newcastle to coal, and departed thence in ballast for the Delaware. Meanwhile the Chicago exporter found that railroad conditions made Norfolk the most convenient port to deliver his corn at the appointed time. When the steamer reached the Delaware Breakwater (just inside Cape Henlopen) the captain received tele-

graphic instructions to go to Norfolk. There he loaded a full cargo of corn and, as the final destination of the corn was still undecided, he sailed to the Channel port of Falmouth for orders. There he was instructed by signal to proceed to Copenhagen, where the corn was discharged and the vessel was ready for another contract which the agents had been trying to arrange since the day they learned of the final destination of the corn cargo.

That operation is typical of scores that are enacted daily. In almost every exchange of ideas connected therewith, the ocean cable or land telegraph plays an important part. The manager of a merchant fleet may control his ships almost as perfectly from his office in London, Liverpool, Hamburg or New York as does a chess player the men on a board before him. There are signal stations over the greater part of the world where the captain of a ship can receive cabled instructions from the central office. It is common to send vessels to sea with the final destination unknown, the captain reporting at some prearranged signal station where he receives further instructions. This is also true with vessels without cargo and seeking it. Nearly all of the grain ships going from the Pacific Coast of the United States to the United Kingdom sail to Cork, southwest Ireland, "for orders" announcing the final destination. Whether the cargo is to be finally consigned to a port in Britain or any one of four or five continental countries is decided by the grain shipper according to the latest market conditions. Vessels bound for northwest Europe, via Suez, often receive final orders at Gibraltar or Falmouth or Lizard's Point. If coming up the South Atlantic, orders are received at Cape Verde or Madeira Islands. A typical case is that of a vessel, which, lying idle at Singapore, was ordered to proceed for orders to a signal station in Lower Burmah. While en route her owner in London sought cargo. By having the vessel go to Lower Burmah he had the possibility of getting a cargo of rice from Rangoon, or proceeding to Calcutta if cargo were offered there. By ordering his ships from station to station the owner or manager on the shores of the North Atlantic keeps in touch with his scattered fleet in the Indian Ocean, Eastern Asia, Australia or the East Indies almost as easily as if they were a mile or two away in the harbor of his own city. The recent equipment of oil barges with wireless telegraph suggests the arrival of the day when the ship owner may under normal conditions be in constant communication with his ship in all places.

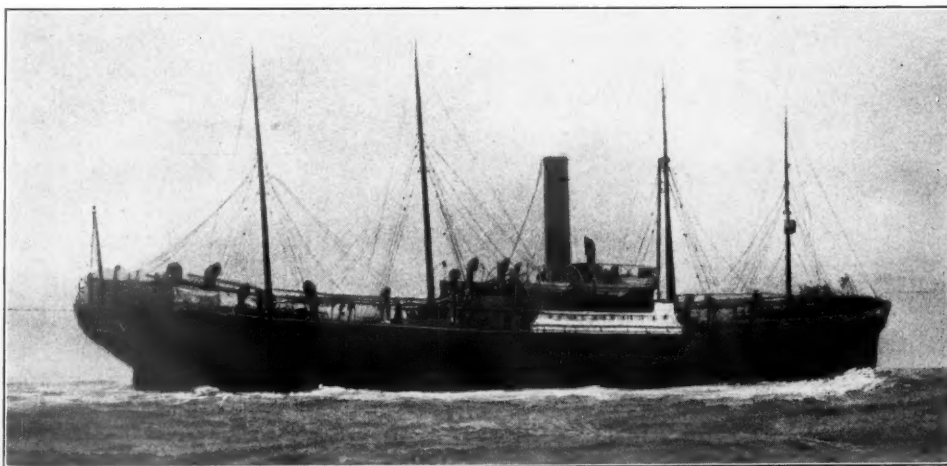
The tramp vessel has earned the name by her absolute freedom of restraint to particular localities, routes or trades. In the constant search for freight she may traverse every sea, and in the course of years, often circumnavigates the globe many times. This roving tendency is increased by the fact that so much of the work done by these vessels is of a seasonable nature, a certain region shipping its product at a certain time only. California wheat is ready to ship at a different season from that of Argentine Republic or India. The corn of the Mississippi Valley is ready to ship later than the wheat from the same region. There is a different sugar season from Hawaii, Peru, Java and Germany. There is a cotton season and a nitrate season, the latter being decided by the greater demand for nitrate fertilizers in the spring planting of the northern hemisphere.

The seasonal nature of the traffic adds to the complexity of the business of ship management. The shipowner has to keep in mind not only the conditions of the contract he is making, but also the prospects ahead of the ship when she must again seek cargo. It is like a game of chess, in that each move must be made with regard to succeeding moves. The shipowner is glad to arrange a voyage that will release the ship in a good location to secure freight, and loath to send her to regions that are devoid of freight, and rates are made accordingly. A cargo of lumber would be taken at a lower rate to New Caledonia, with its export of ores, than to some coral isle in the Mid-Pacific with no export but a few coconuts. Thus the possibilities of two or even three voyages enter into the decision of the rates for one. The manager of vessels that happened to be in India or Java or South America would give, under usual conditions, a relatively more favorable rate for a full cargo to New York than to London because he is reasonably sure of getting a profitable freight cargo away from an American port, and an unprofitable coal or ballast cargo away from Great Britain. As a result of judgments of this character steamers are sometimes started upon a chain of voyages requiring months to complete. For example, a man in London, may have an opportunity to secure a cargo of goods from Liverpool to China, and he takes it because he thinks that by the time his ship has reached China he can arrange for a cargo of Java sugar to New York or Philadelphia, and from that point he can get grain back to Liverpool or London; or the same man might send out his ship from London with a cargo to Australia, because

she could there get a cargo of coal and take it over to Chile in season to secure a cargo of nitrate for a European or American port.

The tendency of the tramp steamer to rove is intensified by the fact that none of the world's greatest trade routes has equal amounts of freight moving along in both directions. North America sends across the North Atlantic more than twice as many tons of freight as Europe sends back. China and Japan import twice or more than twice as much (in bulk) as they export, and the Dutch East Indies, the west coast of South America and the Pacific Coast of the United States all export more than they import. As a consequence the tramp vessel cannot expect to secure cargo both ways and regularly run back and forth on the same route. Ordinarily the tramp must expect, if carrying a profitable cargo, to pass over a certain route in a certain direction, the direction of heaviest freight movement. The ideal of the manager is, therefore to have his ship always discharge one cargo at the profitable or freight surplus end of another trade route. This is clearly impossible. The world's freight cannot be carried without sending vessels to places where there is no return cargo. The fewer the voyages of this character, the greater is the profit and skill of the manager. But voyages without cargo must be taken even under the most careful management.

Lacking cargo the vessel must take ballast to steady her, and for this cause thousands of tons of useless sand, earth, stone and water are carried from country to country. But rather than take ballast for nothing the tramp vessel can afford to carry bulky cargo very cheaply, so it happens that coal and sometimes ores are carried practically as ballast substitutes, and at, or even less than, the actual cost of running the ship. The voyage must be made to secure profitable cargo at the other end, and the cheap coal freight is that much clear gain. Shipowners are sometimes compelled to send vessels from England to the Pacific Coast of the United States, with no choice but to carry sand or coal, and with plenty of competition for



Idaho; Wilson Line. Type of Freighter in Line Service.

the coal. Under these conditions the product of the Welsh mines has been carried from Cardiff to San Francisco for eight shillings a ton, while the return cargo of wheat paid thirty-five or forty, or fifty or more shillings a ton, and gave the shipowner his profit.

The distribution of coal by ocean carriage may, in most cases, be considered a by-product of the charter traffic. There are some cases where coal is carried short distances in lines of vessels especially built for the purpose, but this represents but a small proportion of the total coal carriage. The consideration of the by-product phase of the carrying trade shows that nations are in the best position to export their products cheaply when they import a greater quantity of merchandise than they export, for there is then competition among the shipowners to get the outgoing freight. For this reason the greatest coal exporter is Great Britain, the greatest importer of bulky freight. Next, in respect of the wide distribution of this product, come Australia and Japan, both fourth-rate coal producers, but countries whose imports are more bulky though less valuable than their exports. These countries are able to export coal, widely, yet in none of them is coal so abundant or cheap as in the United States. The United States has not become an important coal exporter, except to adjacent countries, because the heavy exports of raw materials have employed more shipping than our imports required, so vessels come to us in ballast, and a ship that carries coal from an American port must usually return in ballast, making it necessary for the coal freight to pay for both voyages. This cannot be done, because the somewhat more expensive British coal is carried at very low rates as ballast cargo and undersells the American in most foreign ports. The American export of coal is limited almost entirely to Canada and Mexico and to the West Indies, whence we are importing iron ore, sugar and woods, all of them bulky articles, and the outgoing vessels carry the coal. In contrast

to this British coal goes more than half way around the world.

The tramp is cheap but slow and uncertain, she suffices for raw materials, but for a large share of the ocean work she cannot compete. The exchanges of articles of high value per ton, require, because of that value, the more dependable and expensive service of the line vessel.

The regular service in its turn stimulates trade by its regularity, and is a necessary part of the commerce of highly civilized states. Passengers cannot make their arrangements to sail on vessels whose time of departure is uncertain. Like the mails, the passenger traffic requires a definite schedule of sailings, which must be made out months in advance, and announcement made of the day and hour of sailing. Certain classes of valuable freight are scarcely less exacting and there are many lines of vessels carrying freight only that are made to follow an advertised schedule almost as punctually as do the passenger lines.

The distinction between line traffic and charter traffic is in some cases hard to point out. The difference between the work of the best Trans-Atlantic liners and that of a typical tramp steamer or sailing vessel is unmistakable, but there is a point where the two kinds of traffic approach each other closely and, from the standpoint of the vessel, there are many cases in which the distinction cannot be drawn at all, because many vessels pass repeatedly from one service to the other. This transition service is best explained by describing the methods of operating some of the cheaper all-freight lines.

With these, as all other lines, the amount of freight to be carried fluctuates, and the company will often do it all with chartered

the two words, regularity and speed, or in two others, increased efficiency.

The efficiency of the line of steamers is only obtained by incurring certain expenses that are not necessary if the vessel is working independently and carrying special cargoes. These expenses may be classed under the heads: 1. Maintenance. 2. Management and advertising. 3. Costly construction. 4. Speed.

1. The most important single factor about line service, the schedule and its maintenance, is one of the great cares and costs of the managers. When a vessel is scheduled to sail on a certain date, her time may be up before she is fully loaded, or she may be loaded or ready to load and have to wait till the appointed time. Both are expensive to the owner. The making of a schedule must provide for the worst conditions of weather, and then in good weather, the vessels may lie idle in their expensive docks. In keeping up a regular schedule it may be necessary to enter ports when the freights do not warrant the delay and the cost.

In contrast to this is the freedom of the chartered vessel. She takes things as they come, she has made no promises, she sails as soon as she is ready, can be delayed without any further inconvenience than the loss of time, and proceeds only to such ports as best suit the particular conditions of a particular voyage.

Accidents fall with cumulative force upon a steamship line because of the effect upon the schedule. In addition to the direct loss due to the accident, the future sailings and service are often demoralized, and the fulfillment of outstanding contracts becomes a matter of great difficulty and financial loss rather than profit. If a ship is disabled a few days before time for putting to sea, her

place must be filled, and it is difficult and often costly to secure a good steamer in an emergency or even to secure accommodation elsewhere for the passengers and freight that have been engaged. Such necessary shiftings may make a month or more of losses where high profits were expected.

2. Line traffic, particularly when an object is made of carrying passengers, requires a large amount of advertising to catch and keep the attention of the would-be traveler and to create the desire for travel. Allied to the advertising is the elaborate arrangement of offices and agencies in many cities for the selling of tickets and securing of freight. At the port of sailing, the office of the steamship agents managing a high grade steamship line requires an efficient force of clerks. The staff must be organized on the basis of its ability to manage the work at the times of greatest rush—sailing day—although it may be partly idle in the intervals.

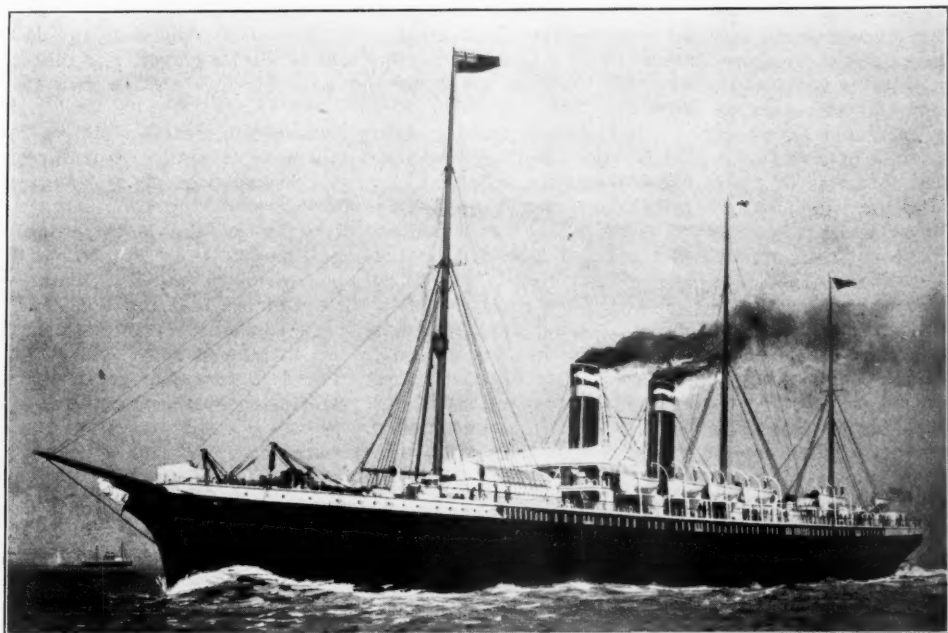
To handle the line traffic in freight requires more clerical work and more warehouse room than the same amount of charter traffic, because of the greater number of shipments to be received, invoiced, cared for till loading time, placed safely in the hold of the ship and finally assembled at the point of discharging cargo. Such cargo is often spread

out in separate lots over a large area of quay or warehouse space. The bulk equipment of grain or other uniform charter cargo can be discharged more easily into coasting or river craft alongside or it may be thrown in great heaps, so that it occupies less warehouse space than any other kind of cargo.

3. Many kinds of line traffic require special types of ship construction. First among these is the passenger service, which is provided for wherever the travel is sufficient to give passengers for a part of each year. Human freight is more exacting than inanimate cargo and while the business is very profitable, it adds greatly to the cost of construction of the steamer, increases the crew and decreases the freight space.

Many kinds of freight require nearly as much special construction as do passengers. This statement applies especially to perishable goods requiring refrigeration. There is a large traffic in frozen meat between Great Britain and the southern hemisphere. The frozen carcasses are taken from a cold-storage warehouse in Argentina or Australasia and carried to Europe in the ship's freezing chambers. Another division of the refrigerator traffic is the larger and rapidly growing use of chambers where the freight is chilled, but not frozen. In this manner is carried the American fresh meat en route to Europe, and the most of the ocean trade in fruits and dairy produce. Some other forms of special construction are found in ships prepared for carrying live cattle, and in tank steamers for the carriage of oil in bulk, and the fruit steamers that carry oranges and bananas from Caribbean and other tropical countries.

4. High speed is not a necessary part of all line traffic, but it is an essential factor and a large element of the cost in those lines carrying passengers and mail, and in some freight lines. The



New York; American Line, 10,798 Tons. Largest and Fastest Type Until 1893.

vessels or own only enough vessels to attend to a sure minimum of business, and when temporary increase of traffic comes the managers turn to the ship market for additional vessels to be taken on time charter, and operated in the line service so long as it seems expedient to do so. When trade decreases the charters of these vessels are allowed to lapse and the fleet is reduced. In this work steamers are often chartered for a year or even two years if rates promise, in the opinion of the charterer, to be steadily rising. Vessels are also taken into the line service for only a single voyage, particularly where there is much more traffic one way than the other. It is common for some of the lines regularly carrying freight from New York to Australia and the Orient to charter vessels for the out voyage only. On these routes returning freight is so scarce that even the vessels owned by the companies may become tramps or are "put upon the berth" at the end of the voyage, and work their way back to New York by whatever indirect route offers the best chance of earning freights. It is a common, almost a regular occurrence for some of the companies operating steamship lines in these trades to announce the date of a steamer's sailing when they cannot give her name, because they have not yet chartered her. Any good tramp steamer may be secured for the assignment at the latest available date.

This elasticity of service is not possible with the lines having passenger service, specialized freight traffic and vessels especially adapted to the trade and built for it. A fleet of such vessels cannot be enlarged by chartering at will.

Despite the traffic of uncertain qualities there is a vast line traffic having pronounced differences from the charter traffic. From the standpoint of traffic these differences may be summarized in

increased consumption of coal has been referred to in the discussion of charter traffic. High speed requires, along with greater coal cost, greater crew to handle the coal, larger bunkers and machinery space, and consequent lessened freight space. Machinery running at high speed wears out sooner and requires more repairing per mile than when operated at lower speed. The fast vessel is also more liable than a slow one to accidents at sea, especially collisions.

As a compensation for the various costs the line steamer has several strong advantages over the chartered vessel. 1. It can charge higher rates of freight on some goods. 2. It can secure more advantageous loads through mixing cargo. 3. It wins patrons and develops trade through acquaintance.

1. The liner monopolizes the passenger traffic, the carriage of mails, and because of its speed or regularity, or both, it can charge a higher freight rate for much valuable express cargo in the transportation of which time is an important factor.

2. In the carriage of ordinary freight the liner has an advantage in its ability to secure mixed cargo, and stow into a given space more tons of freight than can usually be secured by the special cargo vessel, which ordinarily carries a cargo of one article only.

The question of the relation of the bulk of cargo to its weight is a very important one for the ocean carrier. The ship has a certain capacity in dead weight tons, and an absolutely inelastic amount of cubic space into which those tons must be stowed. It is important that both space capacity and weight capacity be utilized, and to do this there should be some heavy cargo to give the weight and some light to fill the space. A full cargo of either is unsatisfactory.

The ocean carrier solves the problem by basing his freight rate on two different units, one of weight and one of cubic contents. Both are called tons, the weight ton and the measurement ton, the latter consisting of 40 cubic feet. The shipowner exercises his discretion as to whether he receives freight on the weight or measurement basis, and, of course, uses the one most favorable to himself. The measurement ton happens to have its particular size because a weight ton of wheat occupies about 40 cubic feet, and as wheat has long been a staple, and often the greatest staple of ocean commerce, shipowners came to think of their vessels in terms of their wheat-carrying capacity, and this grain became the norm for measuring other commodities. Freight goes by weight or measure, at the discretion of the carrier. Hence a shipping company's report of the number of tons of freight carried, gives neither an accurate measure of weight nor cubic content of the traffic, because it is usually composed of unknown quantities of both kinds.

A mixed cargo will give a greater cargo tonnage than a full cargo of either kind, because all vessels will contain more heavy cargo than they can float, and they will float more light cargo than their space can contain. A vessel that can carry 1,000 tons dead weight would have four-fifths of her space empty when carrying a full cargo of iron. On the other extreme a full cargo of wagons or wooden manufactures would not weigh more than 300 or 400 tons. In one case the ship is wasting space, in the other carrying power; but with 700 tons of iron or steel in the bottom of the hold there is still space for possibly 700 tons of light measured cargo, say, wagons and furniture—1,400 freight tons in all. The possibility of making such combinations is constantly before the managers of line vessels, and freight is sought and rates are made with such arrangements in view. If 1,400 freight tons of wagons and steel rails can be put into the vessel that can only carry 1,000 tons of rails alone, the agents can well afford to take both articles at a rate somewhat lower than could have been offered for a full cargo of either, and yet have greater returns than would have come from a full cargo of a single commodity at the full rate—1,000 tons at \$5 per ton equals \$5,000 and 1,400 tons at \$4 per ton equals \$5,600.

The steamer is also much safer to navigate with a full dead weight rather than a light measurement load.

3. The line has also the advantage of getting regular patrons, of making contracts for long periods and of reaping the advantage of the increased trade that its regularity fosters, but it must also maintain its reputation and preserve that regularity of performance during periods of depression and loss.

(To be continued.)

#### Electrification of the Suburban Lines of the Western Railway of France.

As a result of the campaign which it has been conducting against delays to trains in the suburban work of the Western Railway of France, the *Paris Matin* has received a letter from the managing director, a portion of which might well have been written by any one of a dozen managers of American railroads who is dealing with congested terminal facilities. The writer states that inasmuch as *le Matin* has opened its columns to complaints of passengers that are made because of trains that are late in reaching the Saint Lazare station, he confides in the spirit of justice with which the paper is endowed to publish the reply of the railroad company.

In a station like that of Saint Lazare, where the engine and train movements are more than 1,200 a day, it is quite inevitable that there should be some incidents to delay operation. The complaint is that these delays are excessive, and the suburban patrons very properly insist that even the most insignificant of these delays interfere with the satisfactory performance of their daily work. What the public wants to know is whether the company has done all in its power to remedy the situation.

Negotiations were opened with the city of Paris in 1902 for the purpose of running the Auteuil line beneath the Rue de Rome, but the construction of the second Metropolitan line killed all hope of doing away with the Batignolles tunnel. From that time on every effort has been bent towards the suppression of the throat through which all traffic to the Saint Lazare station must pass. And as soon as it was understood that prompt action on the plans could be counted upon, a definite project was presented. This was done in July, 1906, but it was not until May, 1907, that the plans were approved whereupon work was undertaken at once. But while the execution of these works of improvement are being pushed as rapidly as possible, the suburban traffic is constantly increasing. It was 20,000,000 passengers in 1884; 40,000,000 in 1904, and 42,000,000 in 1906.

This expansion of the traffic has not been evenly distributed, as, for example, the line to Versailles and its branches have fallen far behind other portions of the system because of the competition of the tramway lines, whereas that of St. Germain d'Argenteuil has advanced by leaps and bounds. It was 11,100,000 in 1884; 26,000,000 in 1904, and 29,300,000 in 1906. The consequence of this has been an enlargement of the original program and an announcement that the road is prepared to electrify this line.

It is the expectation that the completion of these works will make an entire transformation of the service, not only in the case of the short distance runs, but also of the long ones, and that great elasticity will be given to the Saint Lazare station and its approaches.

The electric lines, starting from a subterranean station below the level of the Cour de Rome, will make it possible to run electric trains between the Saint Lazare station and Germain and Argenteuil without any grade crossings.

The rolling stock will be like that of the Metropolitan, but enlarged. It is estimated that the schedule time will be cut down one-half and that it will be possible to run 20 trains an hour.

The letter concludes with the statement that the Western Railway Company, against whom these constant recriminations have been hurled, has not ceased for an instant in spite of the difficult situation in which it has been placed to struggle for an improvement of its service, and this is manifested by the magnitude of the work which it has undertaken.

#### Coal Production in 1906.

According to the *Moniteur Industriel* the total coal production of the world for 1906 was about 905,000,000 tons. In this there has been a decided increase in some countries over the preceding year; Great Britain, for example, showed an increase of 15,000,000 tons; Germany of about 15,500,000 tons, and the United States nearly 19,000,000 tons. The production of the principal countries is given as follows:

	Tons.
United States .....	370,000,000
Great Britain .....	251,000,000
Germany .....	135,000,000
France .....	33,500,000
Belgium .....	23,250,000
Russia .....	20,000,000
Other countries .....	72,250,000
Total .....	905,000,000

France produced about 1,000,000 tons less than in 1905, probably because of the trouble in the north at the beginning of the year; for, though the output was but 15,000,000 tons during the first six months, it rose to 18,500,000 tons in the last. The United States furnished 50 per cent. more than England; Germany about half as much, and France and Belgium scarcely more than a quarter. If, on the other hand, these figures are compared on the basis of the population of the interested countries, we find that the production in England amounts to 4.75 tons per capita, while that of the United States yields but 4.50 tons; Belgium, 3.25 tons; Germany, 2.25 tons, and France less than a ton. England, which holds the first place in this proportional production, exported, during the first nine months of last year, 46,884,000 tons of fuel, a figure that indicates a considerable advance over the same period for the two preceding years. This was

	Tons.
For 1905 .....	35,309,000
For 1906 .....	41,230,000
For 1907 .....	46,884,000

The increase of 1906 over 1905 was due to large orders from France, Italy, Belgium, Russia and Argentina; while that of 1907 over 1906 came from exportations into Germany, Holland, Belgium, France and Italy; orders from Argentina having been comparatively insignificant.

# GENERAL NEWS SECTION

## NOTES.

The Chicago & North-Western has issued an executive order prohibiting throwing rice and other missiles at or around any bridal party entering or leaving trains.

The Pittsburgh Car Service Association reports that 122,130 cars were handled in its territory during January, 1908, as against 220,654 cars in January, 1907, a reduction of about 44 per cent.

The Supreme Court of Montana, on February 25, declared valid the state law providing that employees must not be worked for more than 16 hours without eight consecutive hours for rest.

The Rock Island has reopened its traffic office at the city of Mexico, indicating apparently another change of policy by the road, which had temporarily withdrawn from the Mexican field.

Announcement is made that the Seaboard Air Line, beginning April 1, will act independently in the matter of party rates and will give a flat rate of 2 cents a mile for parties of 10 or more persons.

It is understood that 85 per cent. of the telegraph operators on the Northern Pacific voted against the proposition made by the road in regard to the new schedule of hours and wages, to become effective this week.

It is understood that the Per Diem Commission to be named by the executive committee of the American Railway Association will consist of Lucius Tuttle, Marvin Hughitt, James McCrea, W. W. Finley and Howard Elliott.

The Nebraska Railroad Commission has ordered the railroads of that state to show cause by March 10 why certain radical reductions should not be made in freight rates and why a maximum distance tariff should not be established.

Announcement is made that there will be a rail connection between the Hudson & Manhattan tunnel at Jersey City and the Erie station, with the ultimate intention of running Erie suburban electric trains of special type into New York City.

The Union Pacific is now charging passengers not holding tickets, 3 cents a mile for 10 miles or less in Kansas and 25 cents excess fare where the regular rate is between 50 cents and \$1.50. If the rate is more than \$1.50, 50 cents excess fare is charged.

The Louisville & Nashville and the Atlantic Coast Line have instigated a friendly suit in Alabama to test the new franchise tax of the state. The Louisville & Nashville paid approximately \$23,659 on account of this tax on February 2 and at once brought suit to recover it.

The Inland Empire System, operating approximately 150 miles of road by steam and electricity in the state of Washington, has adopted a compact rate schedule card for class rates out of Spokane, which is designed to be simple enough so that the shipper can use it himself without difficulty.

Effective March 1, it is understood that a 10 per cent. reduction will be made in the salaries of officers and subordinates on the New York, New Haven & Hartford receiving \$2,000 and upward per year, and that a 5 per cent. reduction will be made in salaries between \$1,200 and \$2,000 a year.

Attorney-General Bonaparte, on March 2, directed United States attorneys to institute suits against 27 railroad companies to recover penalties incurred by them for alleged violations of the safety appliance law, as reported to the Interstate Commerce Commission by its inspectors of safety appliances.

On February 25 the House committee on interstate and foreign commerce authorized a favorable report on the Esch bill, requiring railroads to make reports monthly of all accidents on their lines to the Interstate Commerce Commission, and authorizing the publication of those reports by the commission.

The Erie allows members of the faculty of the Cornell College of Agriculture, who are traveling through the state in the interests of good farming, to travel free on its trains, and also carries seed samples and agricultural matter free when sent to the college for examination, or when sent from the college to the farmer.

The Central Freight Association has agreed to reduce the rate on grain and wheat originating west of St. Louis  $1\frac{1}{2}$  cents, and on oats, flour and other grain products, destined to the Atlantic seaboard, half a cent, effective April 15, to protect the St. Louis market, since St. Louis has no direct lake route for eastbound traffic.

A local surgeon of the Union Pacific in Nebraska, and the

editor of the Gothenberg (Neb.) *Independent*, have been bound over for trial for accepting free transportation from the Union Pacific. These are regarded as test cases, in which the company will make a strong fight against the validity of the state anti-pass law.

Announcement is made that the Burlington has abolished its industrial department, effective March 1. The department was created by W. H. Manss, now with the Chicago Association of Commerce, and for several years the company made large expenditures in educating farmers in various branches of farming along the route.

The Texas Railroad Commission has given the Texas & Pacific until March 15 to make answer whether or not it will comply with the commission's order to make improvements to its physical property in Texas, costing about \$2,000,000. If the railroad refuses to obey the order, the state will seek to have a receiver appointed for it.

The Western Union Telegraph Company has instituted suit against the state of Wisconsin to recover \$12,886, which it alleged was paid as excessive taxes in October, 1907. The complaint says that under the ad valorem law the company's property within the state was assessed at \$1,800,000, whereas the true value was but \$653,544.

Circulars have been sent to shippers in New York providing for a reduction on the charge for all split deliveries from \$9.00 to \$3.00, this action having been made possible by the Interstate Commerce Commission in authorizing the trunk lines terminating at New York to make changes in rates under certain conditions on one and three days' notice.

The Long Island Railroad announces that a year's experience has proved that the refunding of fares because of the failure of commuters to have their commutation tickets with them causes a greater loss of revenue than anticipated or warranted by the legitimate accommodation thus afforded. Therefore these refunds have been discontinued since March 1.

On February 29 the Louisville & Nashville rescinded its recent order reducing the pay of engineers and conductors 10 per cent. on all its lines. The engineers had declined to accept the cut, but the conductors had agreed to a compromise at a reduction from the former scale. Both classes will continue for the present to receive pay on the former basis.

A series of joint rate meetings is to be held, beginning with one in Chicago, March 9, at which the revision of the Chicago joint passenger rate sheet will be undertaken. As soon as this is completed the revision of the St. Louis sheet will begin and others will follow, in accordance with an agreement reached by the Central, Western and Southwestern passenger association lines.

It is not true, as currently reported, that the Erie has abolished piece work in its shops. After a year's trial it has made certain modifications to meet service conditions, but retains the principle as strongly as before. General laborers working in and about the shops have had a reduction of 10 per cent. in their pay, but no reduction has been made on the piece work scale.

The Union Pacific is standing firm in its refusal to make any changes in its system of elevating charges on grain, as opposed to the efforts of certain grain-carrying roads south of the Ohio river to reduce the elevation charge to the shipper. The Union Pacific believes that the assumption of the maximum part of this charge by the railroad has its principal effect in furthering speculation.

Five bishops of the African Methodist Episcopal Church have complained to the Interstate Commerce Commission about the accommodations furnished negro passengers on trains in the South, alleging that the cars are dirty and have inadequate accommodations, and that negroes are not allowed to buy sleeping car tickets or to eat in dining cars, although they pay the full first class fare.

As a result of the reduction in per diem from 50 cents to 25 cents a day, the New York, New Haven & Hartford has re-entered the American Railway Association, but with the proviso that in any future change of rate it shall receive notice a sufficient time ahead to give it opportunity to withdraw from the association if it should desire to do so. The New Haven has stood aloof since October 1, but has charged to itself over \$600,000 per diem at the 50-cent rate.

The Texas Railroad Commission is in a state of mind at the criticism it has received because of its extreme requirements of the railroads at a time when they are unable to raise funds, contributing to the causes of the International & Great Northern receivership. The commission declares that it will put every railroad in Texas in receivers' hands rather than permit operation under

hazardous conditions, forgetting, perhaps, that from time immemorial operation on bankrupt roads has been more hazardous than on roads able to provide for the upkeep of the property.

The Chicago, Milwaukee & St. Paul has asked authority to cancel through passenger tariffs from eastern points to Seattle, via Portland, owing to the recent opinion of Commissioner Clark that through tariffs, involving travel over more than one line, must have the sanction of all the roads involved. The commission has had the question of the establishment of a through rate and joint rate via Portland before it since last summer.

At a labor mass meeting of 1,500 men at Atlanta, Ga., February 24, President Roosevelt's action in ordering an investigation of reductions in railroad wages was endorsed. On the following day the Georgia Railroad Commission ordered all carriers contemplating reductions to furnish the commission with a statement of the proposed reductions and the reasons for them in full. The order is issued under the state law which requires carriers to maintain reasonable service, the commission holding that the reduction of wages without sufficient reason would tend to produce discord and prevent carriers from maintaining a satisfactory service.

At the same time that Georgia was strenuously opposing wage reductions, last week, a delegation of railroad men had an audience with the House committee in Mississippi, protesting against any legislation that would interfere with the management of Mississippi railroads and give the corporation an excuse to reduce wages. When the Mississippi legislature, now in session, first assembled, the Governor sent a message strongly urging a 2-cent law, but the Senate committee, to which this part of the message was referred, has recommended that no action be taken, expressing the opinion that no rate lower than 3 cents is advisable under present conditions in the state, and this report has been adopted by the Senate, to the great encouragement of the railroads.

At a hearing on the nine-hour law before the Interstate Commerce Commission, February 27, the representative of the St. Louis & San Francisco testified that the company would have to increase its rates to offset the charge. The representative of the Southern Railway testified that it would be necessary under the law to employ 220 additional operators, and that the company was unable to do this and meet its other obligations. Similar arguments were presented by a large number of other roads, but the commission showed no desire to help, and on March 2 definitely denied all petitions. It is understood that the Pennsylvania will require 700 additional operators to meet the requirements of the law. The immediate results of this legislation, effective March 4, have been the closing of an exceedingly large number of small telegraph stations all over the country.

The chairman of the Public Service Commission for New York City called attention in a recent address to the very urgent need for new subways in New York and to the fact that under present conditions nobody is interested in building these lines. He felt it was necessary that the state constitution should be so amended as to enable the city to build the subways directly, or else that laws should be passed that would allow private capital to build and operate new lines under conditions which would tempt capital instead of frightening it away. The commission in its recent report to the legislature said that it was necessary to start with the idea that the city's rights were to be protected, and then to make a reasonable and safe contract with the man who is willing to risk his money. If a capitalist is shown that his principal is safe, and that he is reasonably sure of a fair profit on his investment, he will take hold; otherwise he will not.

#### Reducing Liquor Sale on Pullman Cars.

There are now only about eight states where the Pullman Company is selling liquor on its cars. Partly because of state prohibition laws and partly on account of changing public sentiment, the company has for ten years been reducing gradually its liquor business, and has recently added Pennsylvania to the non-liquor list.

#### Acetylene Insurance Rules.

The rules formulated by the National Board of Fire Underwriters for the use of acetylene have hitherto required outside installation of acetylene generators. Although in most sections throughout the United States this rule has not been insisted on, in certain limited sections it has been rigidly enforced. At a meeting on January 30 the board, after considering reports submitted to it by its various committees, amended these rules by striking out such words as prohibited inside installation and substituting the following: "Generators, especially in closely built up districts, should preferably be placed outside of insured buildings in generator houses constructed and located in compliance with Rule 9." Where outside installation is preferred, as above, the rule regarding construction of generator houses has been modified. Such houses formerly had

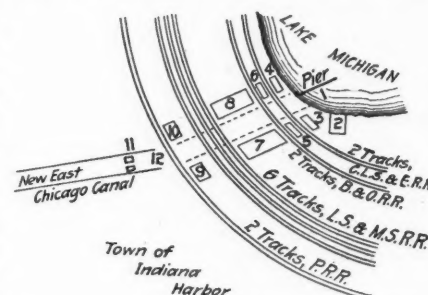
to be fireproof, built of brick and located as far as practicable from other buildings; they may now be located adjoining an insured building, and fireproof construction is not required.

#### Lift Bridge Foundation Work at Indiana Harbor.

The new East Chicago canal empties into Lake Michigan at Indiana Harbor, Ind., at the ore unloading slip of the Inland Steel Co. Lift bridges are to be built over the canal to carry the tracks of all those railroads which skirt the lake shore on their way east. The Pennsylvania, with two tracks, is farthest from the shore of the lake; the Lake Shore & Michigan Southern, with six tracks, is next; then the Baltimore & Ohio, with two tracks; and nearest the lake is

the Chicago, Lake Shore & Eastern, with two tracks. The accompanying plan shows the tracks and the foundations for the bridges.

The average amount of excavation for the piers of these lift bridges is about 5,000 cu. yds. for each two-track lift bridge. On the Lake Shore three double-track bridges are to be built side by side, so the excavation work is obviously less for each



Location of Foundations for Lift Bridges Over New East Chicago Canal.

bridge than in the case of the other three roads, which have only one double-track bridge each.

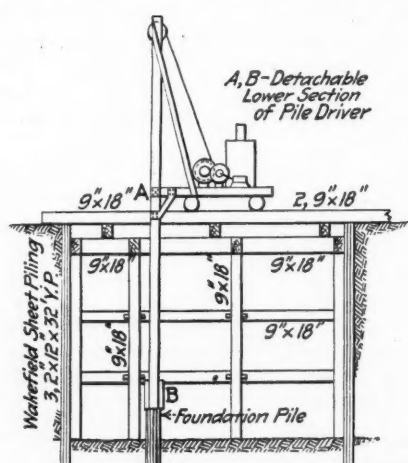
At the beginning of the work on the Lake Shore, Wakefield sheet piling, consisting of 2 x 12 yellow pine timbers, 32 ft. long, was driven and jetted. As shown in the accompanying section of the cofferdam, which is 42 ft. x 105 ft., the piling is 6 in. thick, the joints between the planks being staggered. One 2,000-lb. drop hammer, with a gang of 12 men, at an average of \$2.45 per day, drove 15 ft. of the sheet piling each day. The piling generally sank under the weight of the hammer because of the jetting, and little driving was needed. Excavation began about the middle of September; by the first week in November the work had been carried down 26 ft. and foundation pile-driving started. Ten men at \$1.60 per day, one hoisting engineer at \$3 per day and two men at the gondola car, dumping the 1-yd. cylindrical buckets, constituted the gang for this work. The first 8 ft. was dry sand. Six feet below the top of the sheet piling, 9 x 18 in. walling pieces, with the wider sides against the sheet piles, were placed all the way round the cofferdam. As cross bracing, 9 x 18 timbers, with the greater dimension vertical, were then strung across at intervals of every 15 ft., along the longer dimension of the excavation, and every 14 ft. along its shorter dimension. Vertical posts were set at the junctions of the longitudinal and transverse bracing; these posts were secured to the bracing timbers with 1/2 in. x 4 in. forged angles, each leg 5 in. long, with two holes for 8-in. lag screws. The 9 x 18 in. timbers used in the cofferdam were taken from old bridges and trestles.

As the excavation was carried down, new walling pieces were added at intervals of about 5 ft. until the full depth of 28 ft. was reached. These lower walling pieces, however, were composed of two 9 x 18 in. timbers lagged together and placed on edge against the sheet piling to gain additional strength. Beneath the points of intersection of the walling pieces and the cross bracing vertical 8 x 16 in. timbers were lagged on with the wider side against the sheet piling.

About 8 ft. below the surface, water was found, and two type B Emerson Junior pumps, 180 gals. per minute capacity, each with 4-in. suction and 3-in. discharge pipes, were hung from the upper

timbers. These kept the excavation dry down to its lowest level, 25 ft. below the water line, during the time the foundation piles were being driven. Two other Emerson pumps were used also in the cofferdam for the smaller pier. These weighed 250 lbs. each.

A total of 1,200 piles were driven in the main and minor excavations and 24 men, averaging \$2.45 per day, with one 2,800-lb. and one 2,000-lb. drop hammer in 65-ft. guides, drove an average of 30



Cofferdam for Lift Bridge Foundation; Lake Shore & Michigan Southern.

piles a day, each pile about 45 ft. long. The method of mounting the pile-drivers is shown in one of the drawings. Two chords, 9 x 18 in. each, were lagged together, with joints staggered, and in about 30-ft. lengths, so as to make an 18 x 18 in. beam 60 ft. long. Two of these, spaced about 10 ft. apart, rested on the transverse and vertical cross bracing of the upper tier. Across these two were laid two extra heavy 10-in. wrought-iron pipes which served as rollers for the hoisting engine which operated the drop. Since the piles were not driven until the excavation had reached its lowest level, there were four different tiers of cross bracing which interfered with the lateral movement of the pile-driver guides; instead, therefore, of lifting the entire 65-ft. length out of the excavation whenever the progress of the pile-driving made it necessary to cross a longitudinal or transverse bracing timber, the lower 30-ft. section of the pile-driver guides was made detachable. By taking out eight bolts the hoisting engine could lift this lower section above the upper tier of cross bracing and the engine was pushed over into the next shaftway, where the lower section was again dropped into place, attached, and the pile-driving resumed. The change required a little over five minutes.

A 1-yd. Hayward orange peel bucket was used in the excavation for the Pennsylvania bridge. One No. 3 Emerson standard pump, with 725 gals. capacity, 5-in. suction, 4-in. discharge and 1 1/4-in. steam pipe was used. A similar size was used in the B. & O. excavation and another of the same size in the C., L. S. & E. excavation.

#### Southern Pacific Service Accelerated.

The Southern Pacific rail and water lines have put into effect the following revised service:

Freight leaving Boston Tuesday by New England Steamship Co. or Metropolitan line will go forward from New York on Morgan line steamer, sailing the following Thursday.

Freight leaving Boston Thursday by New England Steamship Co. or Metropolitan line will go forward from New York on Morgan line steamer, sailing the following Saturday.

Freight leaving Boston Saturday by New England Steamship Co. or Metropolitan line will go forward from New York on Morgan line steamer, sailing the following Tuesday.

Freight leaving Philadelphia Monday and Tuesday by Clyde line will go forward from New York on Morgan line steamer, sailing Thursday.

Freight leaving Philadelphia Wednesday or Thursday by Clyde line will go forward from New York on Morgan line steamer, sailing Saturday.

Freight leaving Philadelphia Friday and Saturday by Clyde line will go forward from New York on Morgan line steamer, sailing the following Tuesday.

Freight leaving Baltimore Monday by New York and Baltimore Transportation line will go forward from New York on Morgan line steamer, sailing the following Thursday.

Freight leaving Baltimore Wednesday by New York and Baltimore Transportation line will go forward from New York on Morgan line steamer, sailing the following Saturday.

Freight leaving Baltimore Saturday by New York and Baltimore Transportation line will go forward from New York on Morgan line steamer, sailing the following Tuesday.

Freight leaving Richmond Monday by Old Dominion line will go forward from New York on Morgan line steamer, sailing the following Thursday.

Freight leaving Richmond Wednesday by Old Dominion line will go forward from New York on Morgan line steamer, sailing the following Saturday.

Freight leaving Richmond Friday by Old Dominion line will go forward from New York on Morgan line steamer, sailing the following Tuesday.

#### President Urges Improvement of Inland Waterways.

President Roosevelt has transmitted to Congress the preliminary report of the Inland Waterways Commission and accompanies the report with a message of considerable length in which he reviews the whole subject. He says, in part:

"Our river systems are better adapted to the needs of the people than those of any other country. In extent, distribution, navigability and ease of use, they stand first. Yet the rivers of no other civilized country are so poorly developed, so little used, or play so small a part in the industrial life of the nation as those of the United States. In view of the use made of rivers elsewhere, the failure to use our own is astonishing, and no thoughtful man can believe that it will last.

"The Commission finds that it was unregulated railroad competition which prevented or destroyed the development of commerce on our inland waterways. The Mississippi, our greatest natural highway, is a case in point. At one time the traffic upon it was without a rival in any country. The report shows that commerce was driven from the Mississippi by the railroads. While production

was limited, the railroads, with their convenient terminals, gave quicker and more satisfactory service than the waterways. Later they prevented the restoration of river traffic by keeping down their rates along the rivers, recouping themselves by higher charges elsewhere. They also acquired water fronts and terminals to an extent which made water competition impossible. Throughout the country the railroads have secured such control of canal and steamboat lines that to-day inland waterway transportation is largely in their hands. This was natural and doubtless inevitable under the circumstances, but it should not be allowed to continue unless under careful Government regulation.

"Comparatively little inland freight is carried by boat which is not carried a part of its journey by rail also. As the report shows, the successful development and use of our interstate waterways will require intelligent regulation of the relations between rail and water traffic. When this is done the railroads and waterways will assist instead of injuring each other. Both will benefit, but the chief benefit will accrue to the people in general through quicker and cheaper transportation."

#### Mr. Truesdale on the Railroad Situation.

The following comments are taken from the current annual report of the Delaware, Lackawanna & Western:

The two great political parties of the country, in planning their forthcoming presidential campaigns, make the sins of the railroads and their management, and drastic correction of the same, their leading issues, and herein may be found the real underlying cause of the general, indiscriminate abuse of the railroads and of their management, and of the paralytic stroke which they and all interests connected with them have suffered. With great foresight and shrewdness those who have planned and are responsible for this political program have alienated from the railroads the chief political influence that they might and should have every reason to expect would use their influence to protect them against a campaign of this kind, their own employees. This has been accomplished by the passage of certain laws governing the hours of service, wages, conditions of employment generally, and others more far-reaching have been promised and are now pending.

After declaring that the sweeping denunciation of the managing authorities has weakened their authority over their employees, Mr. Truesdale added:

"No greater blow has been dealt the railroad interests of the country, none that will react more quickly or with greater permanency on the public at large, than the legislation that has been enacted and that is proposed and pending, the effect of which is to take from those in charge of the management of railroads the reasonable and proper control of these properties, including especially the army of employees engaged in their service in various capacities. The tendency, furthermore, to place the control of the railroads and their operations, down to the minutest detail, in the hands of public officers, boards or commissions, all of which are subject to political influences to a greater or less degree, is by no means hopeful or reassuring as respects the future value or efficiency of the transportation facilities of the country."

#### TRADE CATALOGUES.

*Spiral Riveted Pipe.*—The American Spiral Pipe Works, Chicago, has issued circular No. 21, showing some of the many uses, as well as the advantages and economies, of Taylor's spiral riveted pipe with forged steel flanges. It is claimed to be the strongest riveted pipe made, by 30 to 50 per cent. A half-tone from a photograph shows a section of 12-in. pipe, 16-gage steel, which is stated to have withstood a hydraulic pressure of 650 lbs. per sq. in. The parts between seams bulged 3/4 in., but the seams were practically unaffected. Strength to resist collapse under vacuum or heavy fills, and strength and rigidity against bending are other good qualities claimed. Many photographic views of the pipe in use in various applications are shown, and details of the different joints, and other details, are illustrated and described. The circular is 8 in. x 10 in. and has 20 pages.

*Shoulder Flange Tie Plates.*—The Railroad Supply Co., Chicago, has issued an attractive 16-page pamphlet on Wolhaupter shoulder flange tie plates. This is a new form of tie plate, being the standard Wolhaupter plate with a shoulder rolled on it. The results of some interesting tests made by R. W. Hunt & Co., Chicago, are recorded. A compression test to determine the comparative loads required to imbed the Wolhaupter and a flat-bottom plate in a tie showed a difference in favor of the former of 9,100 lbs. Other tests were for track spreading and for transverse bending strength.

*Missouri Pacific.*—The passenger department has issued a pamphlet describing the attractions of Hot Springs, Ark. It treats the resort from different points of view as it appeals to different

classes of travelers: those who go to get the benefit of the springs, those who are looking for open air combined with rest and comfort, or those who want to play golf. The pamphlet gives estimates of living expenses, and a list of hotels and their characteristics and rates. The passenger department is to be complimented on the taste shown in the photographs selected for illustrating the pamphlet and for such a high grade of press work that the views lose nothing in reproduction.

*Santa Fe Employees' Magazine.*—The February number has 60 pages and is full of interesting matter. The run of the "Scott Special," made in July, 1905, which holds the world's long-distance speed record, is re-described. Other articles are "Teamwork—Avoiding Claims"; "Investing Money," reprinted from the *Outlook*; "Locating Piston Valve Defects"; "The Past, Present and Future"; "Brave Work in the Rockies," the first prize winner in the short-story contest, and a number of shorter articles, with the usual items and notes of interest.

*Switchboards.*—Bulletin No. 4,558 of the General Electric Co., Schenectady, N. Y., describes and illustrates isolated switchboard panels with circuit breakers. These panels are for controlling 125-volt generators of from 5 to 120 k.w. capacity, and 250-volt generators of from 10 to 240 k.w. capacity. Bulletin No. 4,544 is devoted to direct-current switchboards for railroad use, which include generator panels, rotary converters, panel circuit breakers, etc.

*Journal Boxes.*—The T. H. Symington Co., Baltimore, Md., has issued a pamphlet describing and illustrating, with half-tones, different types of journal boxes, including the torsion spring lid box for freight service, and the pivot lid box for locomotives, tenders, steam passenger cars and electric cars. The company is also prepared to furnish boxes with M. C. B. pressed steel or malleable lids, Fletcher lids and lids of special design.

*Air Compressors.*—Bulletin No. 4,564 of the General Electric Co., Schenectady, N. Y., is devoted to centrifugal air compressors for industrial air blast and exhaust service. These compressors are made to deliver air at pressures from 0.88 to 4 lbs. per sq. in., and in capacities of from 750 to 10,000 cu. ft. of free air per minute. The compressors are driven by Curtis steam turbines or electric motors.

*Steel Rail Specifications.*—The American Bureau of Inspection and Tests, Monadnock block, Chicago, has prepared a booklet containing the specifications for standard Bessemer steel rails recently adopted by the manufacturers of the United States and Canada. The booklet also contains useful tables for figuring quantities of track material. Copies may be had on request.

*Electrical Switch Indicators.*—Bulletin No. 4,563 of the General Electric Co., Schenectady, N. Y., illustrates and describes S. I. 104 switch indicators.

#### MANUFACTURING AND BUSINESS.

The main office and works of the Pennsylvania Brake-Beam Co. have been moved from Easton, Pa., to Danville, Pa.

The offices of the American Car & Foundry Co., New York, will, about May 1, be moved from 25 Broad street to the new City Investing building.

The Wisconsin Engine Co., Corliss, Wis., has established a branch office in the Candler building, Atlanta, Ga. Julius M. Dashiell has been appointed Sales Manager.

The American Water Softener Co., Philadelphia, Pa., has opened a filtration department under the management of George F. Hodgkinson. The company is prepared to install filtration plants of any capacity.

L. R. Pomeroy, who has been for a number of years special representative of the railroad department of the General Electric Co., Schenectady, N. Y., has gone to the Safety Car Heating & Lighting Co., New York, as Assistant to the President.

Frank Engelhardt, in charge of the Chicago sales office of the Wisconsin Engine Co., Corliss, Wis., has resigned. The company has closed the office and, for the time being, the business from that district will be under the direct charge of C. T. Myers, General Sales Manager, at Corliss.

The Southern Railway Supply Co. has bought the business and good will of the H. F. Vogel Contracting & Railway Supply Co., St. Louis, Mo. The new company will do a general railroad supply business. The management is in the hands of J. F. Bartman, Secretary, and the offices and storerooms are at 417 Walnut street, St. Louis.

E. H. Symington, Manager of Western Sales of The T. H.

Symington Co., Baltimore, Md., who suffered a fractured skull by being thrown from his horse in Chicago nearly a year ago, has returned from a trip around the world which he took to regain his health. Under the advice of doctors, however, he is about to make another tour of the world, expecting to be at work again in his office in Chicago by next fall.

The Ward-Packer Supply Co., recently organized, with office at 1107 Fisher building, Chicago, has elected the following officers: President, A. D. Ward, St. Paul, Minn.; Vice-President, A. A. Packer, Chicago. J. E. Chisholm, formerly with the motive power department of the Chicago Great Western, is mechanical engineer. The company was organized to deal in railroad, factory, mill and general supplies, and has secured exclusive control of a number of articles of merit, including boiler compounds, bell ringers, metallic piston rod packing, boiler feed pump and vacuum car cleaner.

An Ohio paper mill which had ordered several engine type generators of the Northern Electrical Manufacturing Co., Madison, Wis., did not specify who should mount the armature on the engine shaft. When the generator was being erected it was found that no jobbing shop was in a position to make the force fit of about 150 tons required for mounting the armature. Accordingly, the manufacturer sent a motor-driven hydraulic press, with necessary rigging, for pressing the armature on the shaft. A small generator was rigged up to furnish current, and the work was quickly done, thus saving the time and expense of shipping parts back to the factory for mounting.

The United States Circuit Court of Appeals for the Third circuit in a decision just handed down has reversed the federal Circuit Court for the District of New Jersey in the suit of the Ajax Metal Co., Philadelphia, Pa., vs. the Brady Brass Co., Jersey City, N. J. The Appellate Circuit finds that the Ajax patent on which infringement was claimed is invalid. The case has been in the courts since 1903. The Ajax Metal Co. claimed that it had invented and patented an alloy capable of holding up within itself more lead than had been previously possible without the use of nickel and had thus produced a bearing consisting of less than 7 per cent. of tin, more than 20 per cent. of lead, and the balance of copper. The validity of the patent had been sustained by the trial court. The recent decision says, in passing on the claims of the plaintiff, that "the patent is for a product and not for a process. There is no claim for any particular method of combining the constituents of this alloy, and the specification only states the ordinary foundry practice well-known and recognized by those skilled in the art." The written opinions and evidence of experts are quoted to confirm the main point, that the alloy in question was not patentable as it "differed in degree and not in kind" from that which had been on the market for a long time. Testimony is quoted to show that the so-called "critical point" in copper-tin alloys was known at least three years prior to the application for the patent. The opinion also says: "A mere difference in the proportions of the constituents of an alloy, however useful the result may be, does not entitle the originator to the monopoly of a patent, in the absence of other circumstances than those here disclosed. Being of the opinion that the patent in suit is invalid, it is unnecessary to consider other grounds of defense, though we may be permitted to say that the prior public use, set up in the answer of the defendant, seems to us to have been sustained by the testimony."

#### Iron and Steel.

The Great Northern has ordered 10,000 tons of rails from the Cambria Steel Co. and 5,000 tons from the Bethlehem Steel Co., these orders being in addition to those for 45,000 tons placed with other companies recently.

#### OBITUARY NOTICES.

Russell Harding, formerly Vice-President and General Manager of the Missouri Pacific system, and later President of the Pere Marquette and Vice-President of the Cincinnati, Hamilton & Dayton, died on March 3 in New York City. A fuller record of his railroad career will be published later.

William A. Washburne, New York rail sales agent of the Cambria Steel Company, died at his country home in Salisbury, Conn., on February 26. Mr. Washburne had been ill for nearly two months, but continued to come to his office in New York until a week before his death. He had represented the Cambria Steel Company and its predecessor, the Cambria Iron Company, for 14 years. Before this he was in the rail department of the New York sales office of the Pennsylvania Steel Company.

Charles T. Hempstead, formerly General Passenger Agent of the New York, New Haven & Hartford, died at his home in Glenbrook, near Stamford, Conn., on March 4, from Bright's disease. He was 64 years old. When Mr. Hempstead retired in 1905 on ac-

count of ill health, he had completed a service of 43 years, his first position being ticket agent at Hartford. He became Paymaster of the old Hartford & New Haven Railroad, Paymaster of the New Haven system, and, finally, General Passenger Agent.

#### MEETINGS AND ANNOUNCEMENTS.

(For dates of conventions and regular meetings of railroad conventions and engineering societies, see advertising page 24.)

##### Railway Club of Pittsburgh.

At the meeting of this club, Feb. 28, a paper on Steel Car Construction and Maintenance, by G. E. Carson (P. & L. E.) was read.

##### Canadian Society of Civil Engineers.

At the meeting of this society, Feb. 27, a paper on the Mechanical Equipment of the Ottawa Mint, illustrated by lantern slides, was read by the author, A. H. W. Cleave.

##### Railway Signal Association.

The March meeting of this association will be held at the Great Northern Hotel, Chicago, on Monday, the 16th, beginning at 10 a.m. The subjects to be discussed are the report on specifications for electric interlocking, beginning at No. 60; the report on specifications for automatic block signals; also the paper on storage batteries which was presented at New York in January. All these reports have been discussed in part at previous meetings. In this announcement the Executive Committee gives the names of representative members of the association who have been appointed by 25 railroads. The committee also gives the result of the letter ballot, ordered at the Milwaukee meeting, last October, the result of which is the adoption of the report of the special committee on interlocking and block signals, which was presented at Milwaukee, and which was given in the *Railroad Gazette* of October 18. This report, it will be remembered, presented a comprehensive scheme of uniform signal indications. The letter ballot was as follows:

Active members .....	394
Representative votes cast .....	225
Individual votes cast .....	119
	—344
Affirmative .....	257
Negative .....	87

#### ELECTIONS AND APPOINTMENTS.

##### Executive, Financial and Legal Officers.

*Canadian Pacific.*—F. W. Peters, Assistant Freight Traffic Manager of the western lines, has been appointed Assistant to the Second Vice-President, with office at Winnipeg, Man.

*Chicago Great Western.*—See Minneapolis, St. Paul & Sault Ste. Marie.

*Delaware, Lackawanna & Western.*—W. S. Jenny, General Attorney, has been elected also a Vice-President. The other two Vice-Presidents are in charge, respectively, of the coal department and of the traffic department.

*Illinois Central.*—Joseph F. Titus, Assistant to the President, was elected a Director at the adjourned annual meeting held March 3, succeeding Stuyvesant Fish. Mr. Titus is to resign shortly and be succeeded by J. Ogden Armour, who is not yet a stockholder of record.

*Minneapolis, St. Paul & Sault Ste. Marie.*—J. L. Erdall, Assistant General Solicitor of the Chicago Great Western, has been appointed Assistant General Solicitor of the Minneapolis, St. Paul & Sault Ste. Marie.

*Philadelphia & Reading.*—Llewellyn Snowden, Assistant Auditor of Passenger Traffic, has been appointed Auditor of Passenger Traffic, succeeding Charles H. Quarles, retired.

##### Operating Officers.

*Boston & Maine.*—Fred A. Hortter has been appointed Superintendent of Car Service, succeeding H. E. Howard, relieved from service at his own request. Mr. Hortter will report to the Second Vice-President and General Traffic Manager on matters relating to car distribution, and to the Fourth Vice-President and General Auditor on matters relating to car accounting.

*Canadian Pacific.*—J. W. Leonard, Assistant General Manager of Eastern Lines, has been appointed to the new office of General Manager of the eastern lines in charge of maintenance of way and operation, with office at Montreal, Que. G. J. Bury, Assistant General Manager of Western Lines, has been appointed to the new office of General Manager of Western lines, in charge of maintenance of way and operation, with office at Winnipeg, Man.

J. G. Taylor, Superintendent of Terminals at Ft. William,

Ont., has been appointed Superintendent of the Moose Jaw division, succeeding J. Brownlee, transferred.

C. S. Maharg, Superintendent at Souris, Man., has been appointed Superintendent of Operation and Construction on the new Saskatchewan division.

See this company under Special Officers.

*Chicago, Burlington & Quincy.*—F. L. Johnson, General Inspector of Stations, has been appointed Superintendent at St. Louis, Mo., succeeding J. A. Somerville, resigned to go to another company. See Missouri Pacific.

*Cleveland, Cincinnati, Chicago & St. Louis.*—See Lake Erie & Western.

*Lake Erie & Western.*—C. S. Rhoads, Superintendent of Telegraph, of the Cleveland, Cincinnati, Chicago & St. Louis, with office at Indianapolis, Ind., has had his authority extended over the Lake Erie & Western.

*Mexican Central.*—Ralph Nelson Elliott, who was recently appointed Superintendent of the Torreon division of the Mexican Central, was born on July 28, 1871, at Marysville, Kan. In his early boyhood he lived at San Antonio, Tex., where he had a common school education, and, at the age of 15, entered railroad service on the Texas-Mexican Railroad, part of the National Railroad of Mexico. Two years later he went from Texas to the Northwest, where he was employed on the Columbia & Puget Sound Railroad, a small line belonging to the Oregon Improvement Company. He then served on the Northern Pacific and the Great Northern and was employed by the Puget Sound Reduction Company. In 1894 he went to the National of Mexico, but soon left railroad service again to go to the Waters-Pierce Oil Company. He returned to railroad work in 1902 on the InterOceanic of Mexico, from which he went to the Tehuantepec National. In 1903 he was on the Durango Central and since 1904 has been on the Mexican Central.

*Missouri Pacific.*—J. A. Somerville, Superintendent of Terminals of the Chicago, Burlington & Quincy at St. Louis, Mo., has been appointed Superintendent of Terminals of the Missouri Pacific at Kansas City, Mo., succeeding C. E. Carson, resigned.

##### Traffic Officers.

*Chicago, Indianapolis & Louisville.*—A. C. Tully has been appointed Assistant General Freight Agent, with office at Chicago, a position which has been vacant since the death of N. Staat last November.

*Norfolk & Western.*—DeLos Thomas, Division Freight Agent at Winston-Salem, N. C., has been appointed Assistant General Freight Agent, with office at Roanoke, Va., succeeding O. H. Rogers, deceased.

##### Engineering and Rolling Stock Officers.

*Chicago & Alton.*—See Toledo, St. Louis & Western.

*Grand Trunk.*—See Grand Trunk Pacific.

*Grand Trunk Pacific.*—Wm. Gell, Master Mechanic of the Grand Trunk at Ottawa, Ont., has been appointed Master Mechanic of the Grand Trunk Pacific, in charge of motive power, cars and shops, with temporary office at Winnipeg, Man.

*Mexican Central.*—O. R. Hale, Master Mechanic of the Torreon division, has been appointed Master Mechanic of the San Luis division, with office at Cardenas, San Luis Potosi, succeeding C. F. Roberts.

*Missouri Pacific.*—F. T. Carberry, Master Mechanic at St. Louis, Mo., has been appointed Master Mechanic at Fort Scott, Kan., succeeding J. J. Reid, transferred.

*New York, New Haven & Hartford.*—On the reorganized divisions named in this column on February 14, maintenance of way officers have been appointed as follows: New York division, H. A. Weaver, Division Engineer, office at Harlem River, N. Y.; Shore Line division, F. H. Ellsworth, Division Engineer, New Haven, Conn.; Providence division, J. S. Browne, Division Engineer, Providence, R. I.; Boston-Midland division, G. T. Sampson, Division Engineer, Boston, Mass.; C. J. Bennett, Assistant Engineer, Hartford, Conn.; Old Colony division, J. W. Pearson, Division Engineer, Taunton, Mass.; Western division, W. T. Spencer, Division Engineer, New Haven, Conn.

E. W. Wiggin has been appointed Superintendent of Bridges and Buildings, with office at New Haven, Conn., vice E. E. Pratt, Jr., resigned.

*Toledo, St. Louis & Western.*—H. H. Eggleston, Supervisor of Bridges and Buildings of the Eastern division of the Chicago & Alton, has been appointed Acting Superintendent of Bridges and Buildings, being also in charge of water station service and interlocking plants, with office at Frankfort, Ind., succeeding C. H. Kinney, temporarily relieved on account of ill health.

**Special Officers.**

*Canadian Pacific.*—G. Erickson, Superintendent at Cranbrook, B. C., has been transferred to the forestry department.

**LOCOMOTIVE BUILDING.**

*Dr. Barriosde Lacarda*, Pernambuco, Brazil, has ordered from the American Locomotive Co., through Ellerton D. Hitch & Co., New York, two 2-4-0 type locomotives, with cylinders 9 in. x 16 in.

*The South Manchurian* has ordered five locomotives from the American Locomotive Co. The motive power ordered by this road last spring was built and shipped some time ago, but five locomotives were lost in a shipwreck and the above order is to replace them.

**CAR BUILDING.**

*The Northern Pacific* is figuring on 200 refrigerator cars.

*The Great Northern* is asking prices on from 40 to 45 passenger cars.

*The Chicago, Milwaukee & St. Paul* is asking prices on 15 passenger cars.

*The Cold Blast Transportation Co.*, Chicago, is in the market for 200 stock cars.

*The Atlantic Coast Line* is understood to be figuring on 100 ventilated box cars.

*The Cadiz Company*, Cadiz, Ky., has ordered one passenger car from the Hicks Locomotive & Car Works.

*The Toledo & Indiana* has ordered five flat cars of 60,000 lbs. capacity from the Hicks Locomotive & Car Works.

*A Japanese railroad* has ordered through Frazar & Sale, New York, 168 coal cars from the American Car & Foundry Co.

*The Chilean State Railroads* have ordered, through W. R. Grace & Co., New York, 20 passenger cars from the American Car & Foundry Co.

*The Independent Packing Co.*, St. Louis, Mo., is in the market for 75 second-hand refrigerator cars, but will buy new cars if it cannot secure good second-hand cars.

*New York City Railway.*—Frederick W. Whitridge, Receiver of two subsidiary street railways of this company, has ordered 75 cars for these roads from the J. G. Brill Co.

*The Canadian Pacific* is building, at its own shops, one sleeping car, 72 ft. 2 in. long and 9 ft. 10½ in. wide over frame; two first class cars, with smoking room, 72 ft. long and 9 ft. 10½ in. wide over frame; two tourist cars, 72 ft. long and 9 ft. 10½ in. wide over frame; one colonist car, 67 ft. long and 9 ft. 10½ in. wide over frame; one baggage car, 60 ft. long and 9 ft. 10½ in. wide over frame; five mail and express cars, 60 ft. long and 9 ft. 10½ in. wide over frame; six mail cars, 60 ft. long and 9 ft. 10½ in. wide over frame; 84 thirty-ton box cars, 36 ft. 8 in. long and 9 ft. 5 in. wide over frame; four refrigerator cars, 41 ft. long and 9 ft. 1½ in. wide over frame; 22 stock cars, 36 ft. 8 in. long and 9 ft. 5 in. wide over frame; 162 thirty-ton flat cars, 36 ft. 8 in. long and 8 ft. 10 in. wide over frame; two Hart convertible cars, 36 ft. 8 in. long and 8 ft. 10 in. wide over frame; 12 baggage cars 29 ft. long and 9 ft. wide over frame; three baggage and smoking cars, 65 ft. long and 9 ft. 10½ in. wide over frame; one pile driver, 45 ft. long and 8 ft. 9 in. wide over frame. Bodies and underframes will be of wood. The special equipment includes:

Bolsters (for freight equipment)	Simplex
Brake-beams	Simplex
Brake-shoes (for passenger cars)	Flanged steel back diamond S
Brake-shoes (for freight equipment and baggage cars)	Steel back, diamond S
Brakes	Westinghouse
Center bearings (for box and Hart convertible cars)	One malleable and one steel
Couplers	Tower
Curtain fixtures	Forsyth
Curtain material	Pantasote
Door fasteners (for box cars)	Positive
Doors (for box cars)	Security
Doors (for refrigerator cars)	Refrigerator standard, with La Flare insulation
Draft rigging	Miner tandem
Dust guards (for freight cars)	Harrison
Journal boxes	McCord
Lighting	Plintsch
Platforms	Standard Coupler Co.
Roofs	Canvas, Canadian Pacific standard
Seats (for sleeping cars)	Pullman standard
Seats (for tourist and colonist cars)	Slatted wood
Side bearings (for freight cars)	Susemihl
Roofs (for box cars)	Chicago
Trucks (for freight cars)	Barber roller Simplex
Trucks (for baggage cars)	Goff
Vestibules	Pullman wide
Wheels (for passenger equipment)	Steel tired

*The New York, Ontario & Western* has ordered nine passenger coaches and one chair car from the Pullman Company. The speci-

fications for this equipment were published in the *Railroad Gazette* of October 18, when bids were first asked, the purchase having been, at that time, postponed.

**RAILROAD STRUCTURES.**

*ALTOONA, PA.*—Plans are made and now under consideration for putting up a combined highway and street car bridge at Seventh street, to be 160 ft. long and 50 ft. wide, to cost about \$60,000.

*BEACON PARK, MASS.*—Work is under way by the Boston & Albany putting up a new engine house here, to cost about \$250,000. Similar work has been authorized at Worcester, to cost \$200,000.

*ELLWOOD, PA.*—The town council has passed an ordinance requiring the Pittsburgh, Harmony, Butler & New Castle railroad to pay for the construction of a subway on Fifth street.

*SCRANTON, PA.*—The Scranton Railway Company will provide a temporary bridge during the construction of the new bridge, over the Lackawanna river.

*WINNIPEG, MAN.*—The Grand Trunk Pacific, it is said, is making soundings for a proposed bridge over the Red river.

**RAILROAD CONSTRUCTION.****New Incorporations, Surveys, Etc.**

*BOW RIVER COLLIERIES.*—Application is being made to incorporate this company to build a line from the Bow River collieries to a point on the main line of the Canadian Pacific near Cassils, Alb., about 47 miles. The incorporators include: R. F. Reeve, W. C. Simmons, W. L. Hamilton, C. V. Bennet, B. C. Moore, of Lethbridge, Alb., and Harry P. Cherry, Winnipeg, Man.

*CAPE BRETON.*—Surveys are under way for an extension to be made early this spring from St. Peter's, N. S., to Louisberg, 31 miles. G. E. Johnson, St. Peter's, General Manager.

*CHICAGO, MILWAUKEE & ST. PAUL.*—This company, it is said, is operating its Pacific coast line from Mobridge, S. Dak., west to Terry, Mont., about 250 miles.

*CHICAGO, SOUTH BEND & NORTHERN INDIANA (ELECTRIC).*—This company has decided to let contracts and push work on the extension from South Bend, Ind., west to Laporte, 28 miles, at which point connection will be made with its line in operation from Laporte northwest to Michigan City.

*CHICAGO RAILWAYS COMPANY.*—This company, it is said, will reconstruct many subways beneath the rivers on the North and West sides, to permit the use of larger cars.

*CLEAR LAKE & SOUTHERN (ELECTRIC).*—Surveys are under way and rights of way are being secured for this proposed electric line from San Francisco, Cal., north via Napa, to Lake Port, 135 miles. Grading is expected to be started this summer. LeGrand Brown, Chief Engineer, 34 Ellis street, San Francisco, Cal.

*CROWS' NEST & NORTHERN.*—Incorporated to build from a point on the Crows' Nest line to Michel, B. C., about 27 miles. E. V. Bodwell, the attorney representing the company, says that construction will be started at once. R. G. Belden, J. A. Hemphill, C. L. Butterfield, E. A. Wayland, all of Spokane, Wash., are incorporators.

*EASTON & SOUTH BETHLEHEM TRANSIT CO.*—This company has given a mortgage, the proceeds of which are to be used for finishing the line from Easton, Pa., through Freemansburgh to South Bethlehem.

*INDIANAPOLIS, LOGANSPOUT & OHIO.*—This company, which has been projected from Indianapolis, Ind., north via Sheridan, Russellville and Kempton, to Logansport, 68 miles, has been granted franchises by the city of Indianapolis, and expects to let grading contracts in June. W. A. Osmé, C. E., Logansport.

*KANSAS CITY TERMINAL CO.*—This company, which was incorporated to build a new passenger station for the railroads entering Kansas City, Mo., is now negotiating with the city authorities for the necessary franchises. The work will include a number of yards and retaining walls, highway viaducts and railroad viaducts. Detail plans are not yet made. John V. Hanna, Chief Engineer, Kansas City, Mo.

*LONG ISLAND.*—See Pennsylvania.

*MEXICO MILLING & TRANSPORTATION COMPANY.*—This company has been authorized to build railroads in the municipalities of Guanajuato, La Paz and Santa Rosa, with branches, a total of about 50 miles. Six miles must be built this year, and a similar amount each year until the line is finished. The Department of Communication and Public Works and Geo. W. Bryant will build the line.

*PENNSYLVANIA.*—The report of this company for the year ended December 31, 1907, shows that the four track system on the main

line between Pittsburgh, Pa., and Jersey City was extended, and also the revision of the low grade freight line, formerly the Western Pennsylvania, along the Conemaugh river. There were also improvements to yards and terminal facilities at various points. Rights of way for additional relief lines were bought. On the Middle division, between Van Dyke, Pa., and Port Royal, the four-track system was put in operation early in 1907. Similar work has been continued during the year between Ryde and Mt. Union. This includes building a new 10-mile line, also two stone arches over the Juniata river, the elimination of grade crossings in the borough of Mt. Union, and a reduction in grade and curvature. The section from Ryde to Vineyard was put in service in October, and from Newton Hamilton to a point west of Mt. Union, at the end of 1907. It is expected to have the section between Vineyard and Newton Hamilton finished in May. This will give a continuous four-track system on the Middle division, from Harrisburg to Petersburg, where connection is made with the double-track relief freight line over the Allegheny mountain, also from Petersburg to Altoona, except on about 6½ miles between Spruce Creek tunnel and Tyrone Forge, where there are only three tracks.

On the Pittsburgh division the four-tracking was finished in October from Sang Hollow to Bolivar, including a revision of grade and alignment on about 14 miles. The revision work on the Sang Hollow extension, and laying second track from Dornock Point to Bolivar Junction was finished. Grade reduction work and double-tracking on the Conemaugh division, from Bolivar Junction, west six miles, including a new single-track bridge over the Conemaugh river, was finished. Similar work is under way on this line between Blairsville and Tunnelton, eight miles. On this section, five double-track stone arches have been built over the Conemaugh, and double-track laid on the steel bridge at Social Hall. A new double-track tunnel 760 ft. long has been built west of Bow Station, and grade crossings on this section in the town of Blairsville are to be eliminated. This work is to be finished this summer.

Four tracks between Beatty and Southwest Junction were put in service during the year. A new line was built from Beatty to George, four miles, and an additional track from that point to Southwest Junction. As a result, passenger and through freight service no longer pass through the double-track tunnel at Donohoe. The westbound classification yard at Hollidaysburg was finished, and considerable progress made on the eastbound gravity yard at Pitcairn, part of which is now in use.

On the New Jersey division, track elevation was continued through Camden to eliminate grade crossings between the Delaware river and Cooper's Creek. Similar work was started on the Kensington branch in the northeast part of Philadelphia. The storage and classification yards at Greenville, N. J., were finished and work is being continued on the Pacific street terminal yard in Brooklyn, N. Y.

Improvements finished on the Western New York & Pennsylvania included building the Ebenezer branch in South Buffalo to connect the main line with the ore docks on the lake front so as not to carry freight through the city of Buffalo. Improvements to yards and shops at Olean, N. Y., and at Buffalo were also made.

The Brownsville extension, of the Monongahela division, was built for 4½ miles up the river to a connection with the Pennsylvania, Monongahela & Southern, which is finished to Rice's Landing, Pa., 7½ miles. The Ten-Mile Run branch, which is ultimately to extend from Ellsworth, on the Monongahela division, to Millsboro, on the Pennsylvania, Monongahela & Southern, 15½ miles, has been finished from Ellsworth south for eight miles, and from Millsboro north for 1.6 miles. From the old Redstone extension, the Grindstone branch has also been built. Both these branches were built to supply facilities for extensive coal and coke operations.

Work is now under way on a connecting line at Newberry, along Lycoming creek, between the main line of the Erie division and the Elmira division of the Northern Central; and the line between Jersey Shore and McElhattan is being improved in grade and curvature.

On the tunnel extensions to the new terminal in New York satisfactory progress has been made, and it is expected to finish the work in 1910. From the New Jersey division at Harrison, east of Newark, to the west portal of the Bergen Hill tunnels considerable progress was made on the masonry, superstructure and embankment necessary to carry the line over the railroad trucks on the meadows and the streets. The two tunnels through Bergen Hill, except for about 700 ft., have been excavated, and concrete lining is being put in. The two tubes under the Hudson river are also being lined. Excavation work is finished from the river to the tunnel station approach at Tenth avenue in New York City. Between Tenth avenue and Ninth avenue over half the work has been finished, and on the terminal station site between Seventh and Ninth avenues all the retaining walls and foundations are in place. Steel viaducts are also nearing completion to support adjoining streets and avenues crossing the station site, and work on the steel structure of the station itself is under way. From the terminal site east, tunnel excavation work is finished to the First avenue

shafts on the west side of the East river, with the exception of the section between Fifth and Sixth avenues, and about one-half the concrete lining, and other work is finished. On the four tunnels under the East river two of the iron tubes have now (March 4) been finished, and it is expected to connect the remaining tubes within two months or less. The tunnels under Long Island City from the East river to the East avenue shaft in the borough of Queens have been excavated and iron lined, and two-thirds of the concrete lining is in place. Work is under way between the East avenue shaft and the western end of the Sunnyside yard, near Thompson avenue, where the tunnels reach the surface. This work is being done by the Pennsylvania Tunnel & Terminal Railroad. Work on the Sunnyside yard has been delayed by the necessary relocation of city streets and the construction of highways across the yards to eliminate grade crossings. Work on the viaduct and embankments and bridge masonry is under way. Near the Sunnyside yard, which will be 5,500 ft. long and 1,550 ft. wide, there will be a connection with the Long Island Railroad and the New York Connecting Railroad.

During the year the elevation of the Philadelphia, Baltimore & Washington road through Wilmington, Del., and the new passenger station at that place was finished; also the joint coach yard and north approach to the new union station at Washington, D. C., and revision of the line through Washington.

On the West Jersey & Seashore, grade elevation work and revision of the line was carried out and a freight connection built between Haddonfield, N. J., and Westville.

On the Long Island Railroad additional tracks were put in at various points and yard improvements made. The Bay Ridge line was also improved and the Atlantic avenue improvement was finished.

**PENNSYLVANIA LINES WEST.**—The most important work carried out by this company, as shown in its annual report, for the year ended December 31, 1907, was track revision work in Chicago and in Allegheny City; revision of line and construction of second and third tracks on the Pittsburgh, Cincinnati, Chicago & St. Louis; improvements of yards, docks and other terminal facilities, increased sidings and securing new rights of way.

**PENNSYLVANIA TUNNEL & TERMINAL.**—See Pennsylvania.

**PHILADELPHIA, BALTIMORE & WASHINGTON.**—See Pennsylvania.

**QUEBEC EASTERN.**—Right of way secured and surveys made by this company for a line from Lyster, Que., on the Grand Trunk, to Lime Ridge, and thence to Sherbrooke, 110 miles. Address W. H. Lamby, Secretary, Inverness, Que.

**SOUTHERN PACIFIC.**—It is said that this company has authorized the relaying of about 50 miles of track with 75-lb. rails on the West Side division from Beaverton, Ore., south to McCoy.

**WEST JERSEY & SEASHORE.**—See Pennsylvania.

## RAILROAD CORPORATION NEWS.

**ATCHISON, TOPEKA & SANTA FE.**—Gross earnings for January decreased 6 per cent.; operating expenses increased 3 per cent., leaving a decrease in net earnings of 25 per cent.

**BALTIMORE & OHIO.**—The Baltimore & Ohio, which since 1901 has owned about 75 per cent. of the stock of the Cleveland, Lorain & Wheeling, has bought the minority stock. The Chicago, Lorain & Wheeling has 192 miles of line. Its gross earnings in the year ended June 30, 1907, averaged \$24,000 a mile. In January, 1908, a semi-annual dividend of 2½ per cent. was declared on its common stock, which was the first dividend on this stock. The Baltimore & Ohio has sold \$1,000,000 one-year notes, \$1,000,000 two-year notes and \$1,000,000 three-year notes, secured by the newly purchased Cleveland, Lorain & Wheeling stock.

**CANADIAN PACIFIC.**—According to report from Spokane, Wash., the Canadian Pacific is planning a line from Spokane to Pacific tidewater, through purchase of the right of way of the projected North Coast Railway.

**CHICAGO RAILWAYS COMPANY.**—The National City Bank and N. W. Harris & Company, of New York, recently offered at a price to yield about 5½ per cent., \$2,500,000 first mortgage 5 per cent. bonds of this company, which recently took over the West Chicago and the North Chicago street railway companies. This offering was six times oversubscribed.

**CHICAGO, ROCK ISLAND & PACIFIC.**—A quarterly dividend of 1½ per cent. has been declared on the stock of the Chicago, Rock Island & Pacific Railway. In January, quarterly dividend of 1 per cent. was paid. In 1907, 1 per cent. was paid in January, 1½ per cent. in April, 1 per cent. in July, 1¾ per cent. in October. This year's record, thus far, is, therefore, the same as that of 1907.

Gross earnings for January were \$46,000,000, against \$48,000,000 in 1907. Net earnings, after taxes, were \$1,100,000, against \$1,300,000 in 1907.

**DELAWARE & HUDSON.**—Gross railroad earnings for January were \$1,500,000 against \$1,400,000 in 1907. Net railroad earnings after taxes were \$481,000 against \$459,000 in 1907. There was a falling off in net earnings of the coal department from \$129,000 in 1907 to \$69,000, so that the total net earnings from all departments were \$551,000 against \$587,000 in 1907.

**DETROIT, TOLEDO & Ironton.**—The issue of \$300,000 receivers' certificates was, on February 25, authorized by the United States Circuit Court at Detroit, Mich. Of these, \$100,000 are to be issued at once. There has been a falling off of 50 per cent. in gross earnings, but owing to economies the loss in net income has been only 15 per cent.

**ERIE.**—Gross earnings of the lines in New York State for the three months ended December 31, 1907, were \$11,800,000 against \$12,500,000 in 1906. Net earnings were \$1,700,000 against \$4,100,000 in 1906.

The Erie's cash on hand on December 31, 1907, was \$4,000,000 against \$6,300,000 on June 30, 1907. Bills payable were \$5,575,000 against \$6,500,000 in June.

The New York Public Service Commission of the Second district has denied the application of the Erie Railroad for permission to issue 4 per cent. interest-bearing dividend warrants, payable in 1917, covering the semi-annual dividend of 2 per cent. on the first preferred stock and the annual dividend of 4 per cent. on the second preferred, declared August 28, 1907. See editorial columns.

**GRAND TRUNK.**—A new issue of \$5,000,000 4 per cent. guaranteed stock has been sold at 92½, a yield of about 4½ per cent., in London. There was already \$8,392,200 of this stock outstanding out of an authorized issue of \$50,000,000 (£10,000,000). The new issue, whose proceeds are to be used for double-tracking and other improvements of the line and for new rolling stock, was oversubscribed by about 50 per cent. Its success indicates the advantage which the Canadian roads have at this time over roads in the United States, both in having a market for their securities in London and in being freer from legislation, actual and threatened.

**GULF & SHIP ISLAND.**—Fisk & Robinson, of New York, have offered, at a price to yield 6½ per cent., \$750,000 of the \$1,000,000 authorized 6 per cent. mortgage bonds of 1909-1911.

Gross earnings for January were \$161,000 against \$225,000 in 1907. Net earnings were \$28,000 against \$68,000 in the earlier year.

**HOCKING VALLEY.**—William Salomon & Co., of New York, have offered at a price to yield 6 per cent., \$500,000 4 per cent. equipment notes due semi-annually from August 15, 1908, to February 15, 1918. These notes are secured by 500 new steel under-frame drop bottom gondola cars, whose cost exceeds by 23.5 per cent. the total par value of the notes.

Gross earnings for January were \$329,000 against \$522,000 in 1907, a decrease of 37 per cent. Net earnings were \$42,000 against \$123,000, a decrease of 66 per cent.

**INTERBOROUGH RAPID TRANSIT.**—The stockholders of this company at a special meeting to be held March 17, will vote on making a new mortgage, securing \$50,000,000 5 per cent. bonds, covering the power houses and rolling stock, the Steinway tunnel from Manhattan to Long Island City and the Long Island traction properties owned by the company, and that \$20,000,000 of these bonds will at once be issued. Of these, \$15,000,000 will be used to meet the \$15,000,000 notes maturing on May 1 and the rest to pay off the floating debt, which now stands about \$5,000,000.

**LOUISIANA & ARKANSAS.**—Gross earnings for January were \$79,000 against \$88,000 in 1907. Net earnings were \$21,800 against \$21,500 in 1907.

**LOUISVILLE & NASHVILLE.**—Gross earnings for January were \$3,300,000 against \$4,100,000 in 1907, a decrease of \$800,000. Operating expenses decreased \$73,000. Net earnings were \$621,000 against \$1,326,000 in 1907, a loss of \$705,000, or 47 per cent.

**MEXICAN INTERNATIONAL.**—Gross earnings for January were \$716,000 against \$711,000 in 1907. Operating expenses decreased \$60,000, leaving net earnings of \$263,000 against \$199,000 in 1907.

**NATIONAL RAILWAYS OF MEXICO.**—The merger plan for the consolidation of the Mexican Central, the National of Mexico, the Mexican International, the Interoceanic of Mexico and the Hidalgo & North-Eastern was ratified on February 28 at the city of Mexico. It is reported that the terms of the agreement are little changed from those previously announced (July 12, 1907, page 54).

**NEW YORK CENTRAL LINES.**—Gross earnings for the month of December, 1907, and for the year ended December 31, 1907, were as follows:

Month of December, 1907.		
	1907.	Change
New York Central & Hudson River.....	\$7,432,066	Dec. \$320,711
Lake Shore & Michigan Southern.....	3,308,011	" 254,369
Lake Erie & Western.....	344,424	" 68,630
Chicago, Indiana & Southern.....	259,508	Inc. 25,300
New York, Chicago & St. Louis.....	868,248	Dec. 62,493
Michigan Central.....	2,108,729	" 202,593
Cleveland, Cincinnati, Chicago & St. Louis	1,967,658	" 202,081
Peoria & Eastern.....	230,450	" 38,568
Cincinnati Northern.....	67,395	" 15,230
Pittsburgh & Lake Erie.....	716,047	" 413,118
Rutland.....	209,939	" 10,129
Year Ended December 31, 1907.		
	1907.	Change
New York Central & Hudson River.....	\$98,369,060	Inc. \$6,279,291
Lake Shore & Michigan Southern.....	44,953,475	" 2,409,097
Lake Erie & Western.....	5,066,940	Dec. 145,872
Chicago, Indiana & Southern.....	3,004,483	Inc. 671,751
New York, Chicago & St. Louis.....	10,465,671	" 563,462
Michigan Central.....	28,547,110	" 2,271,522
Cleveland, Cincinnati, Chicago & St. Louis	26,447,804	" 1,852,888
Peoria & Eastern.....	3,010,347	Dec. 48,934
Cincinnati Northern.....	1,005,198	" 22,530
Pittsburgh & Lake Erie.....	14,904,401	Inc. 422,905
Rutland.....	3,058,087	" 258,878

**NEW YORK, NEW HAVEN & HARTFORD.**—The Hartford & New York Transportation Co., which owns the line of steamers running between Hartford and New York and is owned by the New Haven, is to take over the United States Transportation Co., which controls several steamship lines affiliated with the New York, New Haven & Hartford. These are the Joy line, between New York and Providence; the Neptune Line, between New York and Fall River, and the Maine Steamship Co., between New York and Portland, Me.

**NEW YORK, ONTARIO & WESTERN.**—The operating ratio (taxes included in operating expenses) was 80 per cent. in January, 1908, as compared with 72.6 per cent. in January, 1907. Net earnings for January decreased 30 per cent., and net income after charges, 50 per cent.

**NEW YORK-PHILADELPHIA COMPANY (ELECTRIC).**—J. Kearney Rice, of New Brunswick, N. J., was on February 21 appointed by Judge Lanning, in the United States Circuit Court, Receiver of the New York-Philadelphia Company, and David F. Carver, of Newark, was appointed Receiver of the Trenton & New Brunswick and the New Jersey Short Line. Wilbur F. Sadler, Jr., of Trenton, was, on February 18, appointed Receiver of the Camden & Trenton, another subsidiary of the New York-Philadelphia Company. (*Railroad Gazette*, Feb. 28, p. 298.) The various companies have 63 miles of road in operation and 20 under construction out of Trenton south toward Camden and north toward New York. The parent company has contracts with the Public Service Corporation by which it operates cars between New York and Philadelphia.

**PENNSYLVANIA.**—The annual dividend rate on the \$9,641,600 common stock of the West Jersey & Seashore has been reduced by the declaration of a semi-annual dividend of 2 per cent. In 1906 and 1907 6 per cent. a year was paid; in 1905, 5½ per cent.; from 1897 to 1904, inclusive, 5 per cent., and in September, 1896, 2½ per cent.

**PERE MARQUETTE.**—This company is now reorganized and has arranged to exchange its 6 per cent. equipment notes, secured also by \$500,000 refunding mortgage 4 per cent. bonds, for the \$2,600,000 5 per cent. equipment bonds of the Eastern Equipment Company which fell due March 1, 1908. These notes cover equipment bought in 1903 and 1904 and now insured for \$2,745,000.

**PHILADELPHIA & READING.**—Gross earnings of the Philadelphia & Reading Railway for January decreased 17 per cent., operating expenses decreased 17 per cent., and net earnings decreased 16 per cent., as compared with the corresponding month of 1907.

**SEABOARD AIR LINE.**—The coupons which fell due on March 1 on the three-year 5 per cent. collateral trust bonds of 1911 and the series H car trust certificates, as well as the interest due January 1, 1908 on the first mortgage Seaboard & Roanoke 5 per cent. bonds, have been paid by the Receivers.

**SOUTHERN.**—Gross earnings for January decreased 14 per cent.; operating expenses, 11 per cent.; and net earnings, 28 per cent. Net earnings after taxes decreased 37 per cent. The operating ratio was 89 per cent., against 85 per cent. in the corresponding month of 1907.

**UNION PACIFIC.**—The Oregon Railroad & Navigation Company has declared an extra dividend of 75 per cent. on its \$11,000,000 4 per cent. non-cumulative preferred stock, almost all of which, as well as the common, is owned by the Union Pacific. This appears to be similar to the 50 per cent. dividend declared in 1906 by the Oregon Short Line.

**WEST JERSEY & SEASHORE.**—See Pennsylvania.